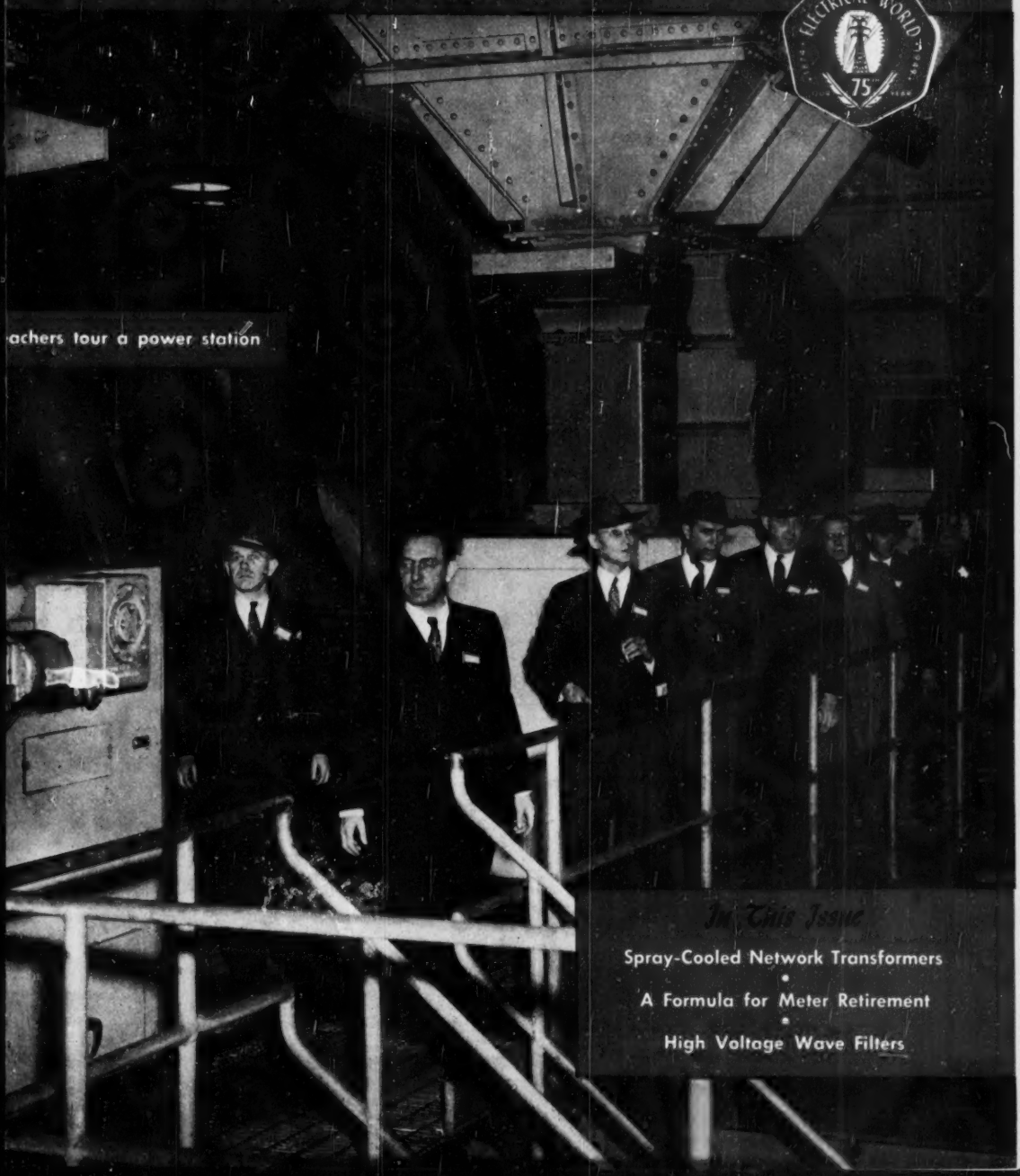
ELECTRICAL WORLD

A McGRAW HILL PUBLICATION

NOVEMBER 19, 1949



achers tour a power station

In This Issue

Spray-Cooled Network Transformers

•

A Formula for Meter Retirement

•

High Voltage Wave Filters

THIS MAN WORKS *Faster Better Safer*

Because the

Murray CROWS'NEST

affords FIRM, SURE FOOTING
PROPER HEIGHT
WIDE REACH
COMPLETE ROTATION

Plus—

The Unmatched *Safety* of Non-Metallic Construction and Semi-Automatic Operation

Steadier . . . stronger . . . safer — that's the Murray demountable Crows'nest, the world's most versatile aerial maintenance ladder. Use it for servicing street lights, inspecting overhead lines, trimming trees, connecting service entrance cables, restoring service when lines go down. Easily operated by only one man, yet strong enough to support ten . . . steady as the truck chassis itself . . . with the inherent safety around high voltage wires that only wood construction achieves!

Murray Crows'nest aerial ladders are available in working heights of 26, 28, 30, 32, 35, 40, 45 and 50 feet. (Ladder at left is the 40 foot size.) They can be mounted on any ¾ ton (or larger) truck weighing 2700 pounds or more. To free the truck for other work, the entire assembly is demounted by removing a single bolt. Write for descriptive bulletin.

Murray

MANUFACTURING CORPORATION

50 Years of Service to the Electrical Industry

1250 ATLANTIC AVENUE • BROOKLYN 16, NEW YORK

Check Murray on your requirements fo

Cable Racks — Cable Protectors
Manhole Wall Inserts
Aluminum Meter Sockets
Padlock Seals — Disconnect Plug
Perforated Strapping — Cable Grip

SERVICE ENTRANCE & METER EQUIPMENT • MAGNETIC CIRCUIT BREAKERS
SWITCHES • CURRENT LIMITING REACTORS • CROWS'NEST AERIAL LADDERS

ELECTRICAL WORLD

Published for 75 years for those engaged in the business of generating, transmitting, distributing or applying electric power

VOL. 132 — NOVEMBER 19, 1949 — NO. 21

EDITORIAL 85

NEWS...The Electrical Week Washington Comment Technical Notes 86

PLANT TOURS PROMOTE FREE ENTERPRISE, by Harold S. Metcalfe 99
Strategic use of plant visits is found effective in promoting a more favorable public opinion

TREND OF GENERATION FOR THE DECADE AHEAD by John R. Carlson 104
Operating temperatures upwards of 1,050 F will be employed with undiminished steam turbine importance

WAVE FILTERS PROTECT CARRIER SIGNALS FROM SHUNTING EFFECT OF CAPACITORS, by W. A. Ringger, Jr. 106
Parallel and series resonant circuit combinations overcome interference from connected equipment

WATER SPRAY COOLING OF NETWORK TRANSFORMERS 109
Distribution today—Step originally taken as emergency operating measure now accepted for economic reasons

AN ECONOMIC FORMULA FOR WATTHOUR-METER RETIREMENT, by W. T. Chapman and A. L. Carvill... 112
Formula indicates whether it is not cheaper to scrap an inadequate meter for the benefits of a new one

HOW TO 117
Dry Chemical Adapted as Fire Extinguishers Economical Multi-Transformer Substation Mounting
Shop-Built Boards Speed Modernization D-c Welder Uses Plate-Type Rectifiers
Rock Salt Cleans Transformer Cooling Coils

ENGINEERING REFERENCE SHEETS 124
Pole and Anchor Guy Application Chart Metering with Current Transformers Inside Power Transformer Delta

LOAD BUILDING 138
Better Street Lighting for Better Business Electrically Heated Tank Saves Tin and Time
Single Unit Range and Water Heater Stairway of Light Standing Up in Service

NEW EQUIPMENT	142	CATALOG AND BULLETINS	172
NEWS ABOUT PEOPLE	154	BOOKS	174
MANUFACTURERS AND MARKETS	164	LETTERS	176
NEW ELECTRICAL CONSTRUCTION	168	INDEX TO ADVERTISERS	184

COVER—School superintendents and principals get new slant on utilities in trip through West Penn Power Co's Springdale Station

RALPH H FLYNN, *Publisher* **FISCHER BLACK**, *Editor* **DANIEL T BRAYMER**, *Managing Editor*

ARCHER E KNOWLTON *Senior Associate Editor*
FRANK R INNES.....*Associate Editor*
ROBERT C BLATT.....*Associate Editor*
W B WHICHARD.....*Associate Editor*
RUE M SHOOP.....*Assistant Editor*
FRANCIS J KOVALCIK.....*Assistant Editor*
KENNETH Y KOST.....*News Editor*
JOSEPH A ROBINSON.....*Pacific Coast Editor*
HOWARD S KNOWLTON..*New England Editor*
EDWARD ALLEN.....*Midwestern Editor*
EARL CARVER.....*Art Editor*
BERLON C COOPER.....*Lighting Consultant*
GEORGE DOYING....*Mgr Washington Bureau*
RONALD D ROSS..*Washington Correspondent*

WORLD NEWS BUREAU, Russell F Anderson, *Editor*; London, Paris, Frankfurt, Moscow, Tokyo, Bombay, Melbourne, Rio de Janeiro, Buenos Aires
DOMESTIC NEWS BUREAUS, Atlanta, Chicago, Cleveland, Detroit, San Francisco, Houston. Correspondents in 43 principal cities
ECONOMICS DEPARTMENT, Dexter M Keezer, *Director*; William F Butler, Sanford S Parker, Robert P Ulin

W W GAREY, *Manager*
DISTRICT MANAGERS, E F Coffey, New York; N V Palmer, Boston; F P Coyle, Philadelphia; C R Lippold, Cleveland; P S Griffin, Detroit; W H Meneilley, Chicago; J T Schaefer, St. Louis

ELECTRICAL WORLD, Published weekly by McGraw-Hill Publishing Company, Inc. Publication Office, 99-129 North Broadway, Albany 1, N. Y. Editorial and Executive Offices, 330 West 42nd St., New York 18, N. Y. James H McGraw (1860-1948), Founder; James H McGraw, Jr, President; Curtis W McGraw, Vice-President and Treasurer; Eugene Duffield, Senior Vice-President, Publications Division; Nelson Bond, Vice-President and Director of Advertising; J E Blackburn, Jr, Vice-President and Director of Circulation; Joseph A Gerardi, Secretary. Subscription rates: Single copy 35 cents. In the United States, $6 a year, $9 for two years, $12 for three years. Canada, $7 for one year, $11 for two years, $14 for three years. (Canadian money at par.) Pan-American countries, $15 for one year, $25 for two years, $30 for three years. All other countries $20 for one year, $30 for two years, $40 for three years. Entered as second-class matter, November 16, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in U. S. A. Copyright 1949, by McGraw-Hill Publishing Company, Inc. Permission required to reproduce any of contents. Cable address McGRAW-HILL, New York. Member ABP Member ABC

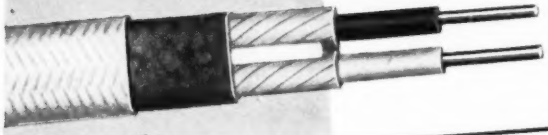
"engineered extras"

IN THESE HAZARD CABLES

HELP YOU GET MORE BUSINESS

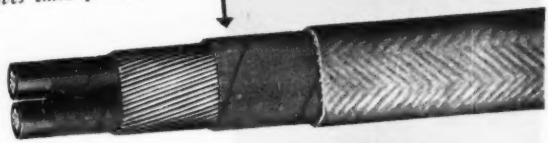
HAZARDEX SNO-FLEX CABLE

Here's a non-metallic sheathed cable with the *extra advantage of a smooth white finish* that gives you a *distinctive* product to sell. It's the cleanest cable to handle, requires no conduit, strips neatly and quickly. The simple construction of Sno-flex makes it fast to splice and install. Sno-flex is the perfect answer to the problem of wiring houses after plastered walls are finished. It costs no more than regular Hazardex. Approved by the Underwriters' Laboratories, Inc. for both open work and concealed wiring.



HAZARD SERVICE ENTRANCE CABLE

With types UBN and ABN, black and red Okobestoprene Tapes are wrapped over the individual insulated conductors in place of the ordinarily used color coded braids. *Okobestoprene Tape, an Okonite developed asbestos-neoprene combination, gives extra protection against flame, moisture, mildew, acids and alkalis.* Another layer of this tape is wrapped over the bare neutral conductor as a moisture seal and to help assure an absolutely clean concentric conductor to work with. This long-lived cable construction is another "no-extra-cost" special from Hazard engineers that helps you get more business. Hazard Service Entrance Cables carry full approval of the Underwriters' Laboratories, Inc.



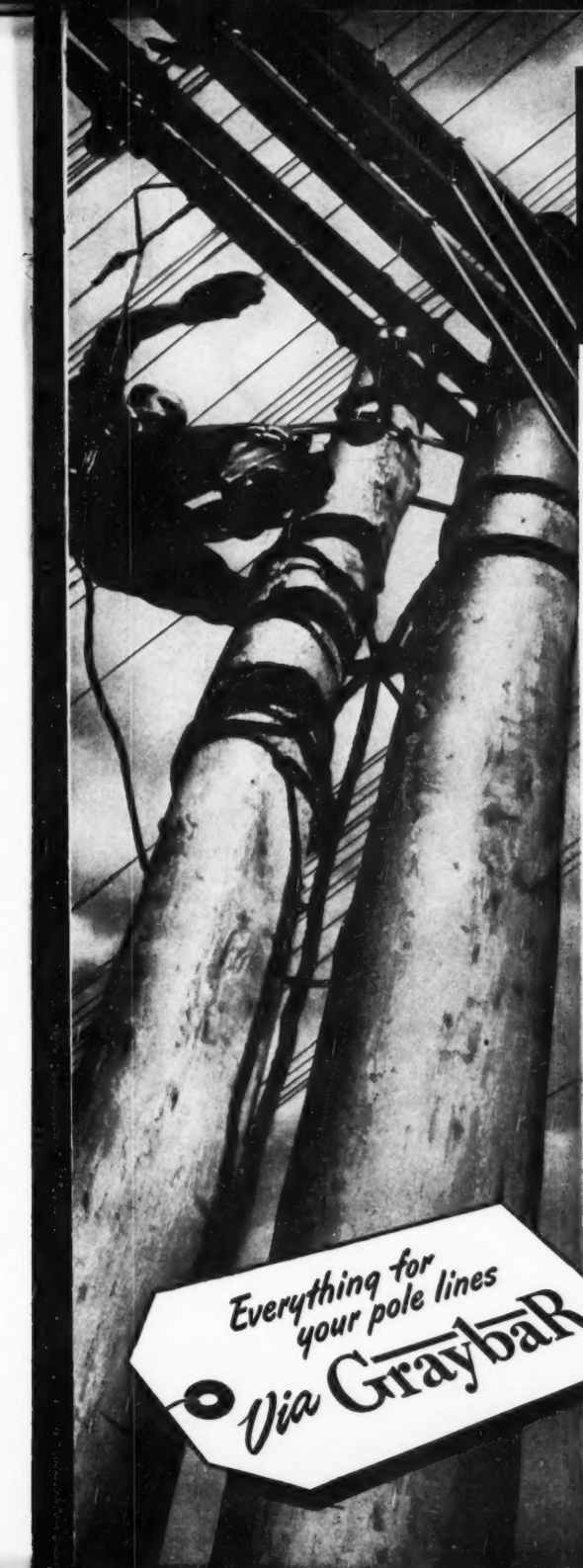
HAZARDEX-WATERTITE ML

For farm wiring or other severe service locations, *the extra protection against moisture and acid engineered into this special non-metallic sheathed Hazard cable is without equal.* The individual conductors are protected with Watertite insulation. This Hazard developed, moisture-resistant insulation has proved its durability in severest service for many years, in both above-ground and direct-burial installations. Over each insulated conductor a thin neoprene covering is added for still more protection. The entire cable assembly is finally guarded against moisture, destructive fumes, oil, fire, heat, sun, weather and abrasion by a tough Hazaprene Sheath. Hazardex-Watertite ML is a compact, easy to handle, unusually quick to install cable.

For more information about the above Hazard cables see your jobber, your Hazard representative or write to Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZARD insulated wires and cables for every electrical use

7723



TIGHT JOINTS

AT ALL POINTS . . . "VIA GRAYBAR"

Reliable Connectors, Splices

Graybar can supply everything your linemen need for connecting all types of lines *securely*. Some examples, made by Reliable: (1) Solderless tap connectors, with precision threads that maintain high-pressure joints. Composed of 90% copper high-strength bronze, they resist corrosion and are not subject to season cracking. (2) Flip-on tap clamps and hot line clamps. (3) Straightline splices, insulated splices, and splice reducers.

O-B INSULATORS

In these days of overloaded distribution systems, no line is stronger than its insulators. Graybar supplies superior-quality Ohio Brass insulators in strain, pin, and suspension types.

ONE SOURCE FOR ALL

For both transmission and distribution lines, Graybar has everything "from the bottom of the hole to the top of the pole"! By ordering all your pole-line needs from this single source, you save time and paper-work expense. You get the leading lines of poles, crossarms, insulators, hardware, strand, line trucks and tools. And you get them the quickest way possible — delivered wherever you specify.

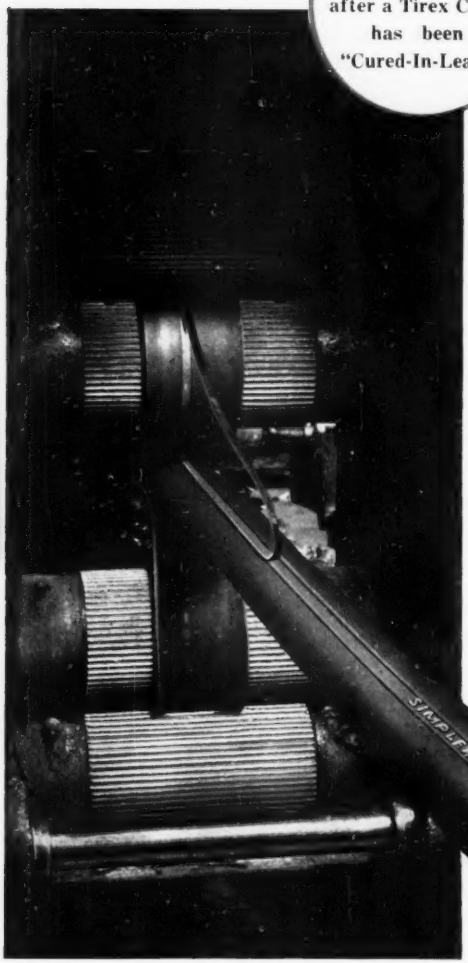
Men who know your needs

When you call on Graybar, for supplies or for information, you can expect us to meet your needs both promptly and accurately. That's because Graybar has been familiar with your needs ever since the first lines went up. You're welcome to the help of the near-by Graybar Outside Construction Specialist in planning any pole-line or underground project. *Graybar Electric Company, Inc. Executive offices: Graybar Building, New York 17, N. Y.* 48A6

IN OVER 100 PRINCIPAL CITIES

MAKING A **TOUGH** CABLE

Tougher!



Stripping off the lead sheath after a Tirex Cable has been "Cured-In-Lead"

. . . That's what the "Cured-In-Lead" process is doing for every TIREX portable cable — adding extra wearability to their Selenium Neoprene Armor to assure long, trouble-free service under the most severe operating conditions.

HERE'S HOW IT'S DONE

Before jacket vulcanization the cable is run through a lead press which forms a lead "pipe" snugly around the jacket. During vulcanization this pipe firmly holds the cable, preventing any distortion of the jacket while it is still soft and pliable and assuring maximum density. When vulcanization is completed the lead is stripped off leaving an extra-tough jacket that needs no additional protection.

HERE'S WHAT IT DOES

It produces a jacket that is unexcelled for effective resistance to abrasion and rough handling . . . provides it with a smooth outer surface which slides easily around obstructions without cutting or tearing . . . maintains uniform diameter, assuring easy and compact reeling or coiling . . . furnishes the means for positive identification of the size, type, number of conductors, and operating voltage of each cable as markings inside the lead pipe can be transferred to the jacket during vulcanization.

All TIREX Cables, and TIREX Cords too, are cured in lead. They are made in sizes and types to meet the requirements of all portable electric equipment. For a complete description of the "plus values" they provide, write us today for Folder 993.

SIMPLEX-TIREX

SIMPLEX WIRE & CABLE CO.
79 Sidney Street
Cambridge 39, Mass.

TEXACO REGAL OILS (R & O) are especially made for turbine lubrication. They are highly refined from selected base stocks and fortified *at the refinery* with powerful rust and oxidation inhibitors, and specially processed to prevent foaming.

Throughout their extra-long service life, *Texaco Regal Oils (R & O)* keep turbine lubricating systems clean . . . assuring constant flow of cool, clean oil to bearings . . . maintaining the instant responsiveness of governors.

Texaco Regal Oils (R & O) meet the stringent requirements of all leading turbine builders, and the turbine oil specifications of the U. S. Navy.

Let a Texaco Lubrication Engineer give you the facts—backed by case histories. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N.Y.

TEXACO

TEXACO Regal Oils (R&O)
FOR ALL TURBINES

HE'S DELIVERING ANOTHER LOAD OF CENTRAL RIGID STEEL CONDUIT

CENTRAL
~~SPANG~~
CONDUIT

● Yes, you can depend on your Central Rigid Steel Conduit Distributor for rocket-fast delivery of nearly all the things he has for sale.

What's more you can depend on him for quality products and materials . . . like Central Rigid Steel Conduit. It has always been known for its fine bending, threading and cutting qualities. And the complete stock of Central Black, Cenlaco or Central White Rigid Steel Conduit carried by your distributor, makes it easy for you to get the type of electrical raceway that best suits your requirements.

When you need conduit or other electrical supplies, contact your Central Rigid Steel Conduit Distributor first . . . you'll find that he's a dependable source of supply.

SPANG-CHALFANT
Division of The National Supply Company
General Sales Office: Grant Bldg., Pittsburgh, Pa.
District Offices and Sales Representatives in Principal Cities

CENLACO a hot dipped galvanized and lacquered finish, inside and out.

CENTRAL WHITE electro-galvanized outside and black enameled inside.

CENTRAL BLACK permanent, baked-on black enamel finish, inside and out

Get this Low Cost Oil Protection

IN YOUR NEXT SUBSTATION TRANSFORMER

Sealed Tank Design

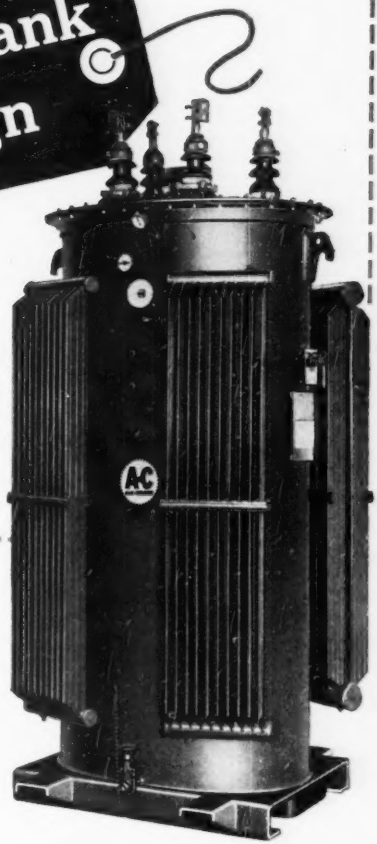
SIMPLE . . . PROVEN . . . readily adaptable to lower kva power transformers at *lower cost* . . . these are reasons why Allis-Chalmers Sealed Tank design is recommended for power transformers 34.5 kv and less, 2500 kva and below.

By providing an air-tight seal, atmospheric oxygen and moisture are permanently sealed from transformer oil, thus preserving its dielectric qualities and preventing formation of sludge.

Sealed Tank design is just one of several types of Allis-Chalmers oil protection. Others include the famous *Oil-Sealed* Inert Gas and the *Expansion Tank* methods . . . each designed for greatest effectiveness in its own range and type of application.

For further information on A-C oil protection, or any other phase of Allis-Chalmers quality transformer construction, contact your A-C sales representative. Or write direct. A-2799

ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.



✓ *SIMPLE* . . . . No wearing parts . . . no expensive alarm systems required . . . no replenishment schedule to follow.

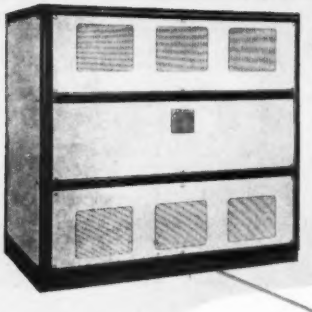
✓ *PREVENTS SLUDGE* . . . Filtering requirements are reduced because oxygen and moisture are *positively* sealed out.

✓ *PREVENTS ACIDITY* . . . Positive moisture seal also prevents formation of harmful acids — helps to preserve transformer insulation.

✓ *LOW OPERATING TEMPERATURE* . . . Cooling ducts are kept open because oil remains sludge-free . . . permits cool, efficient operation of transformer.

ALLIS-CHALMERS

A-C ALLIS CHALMERS

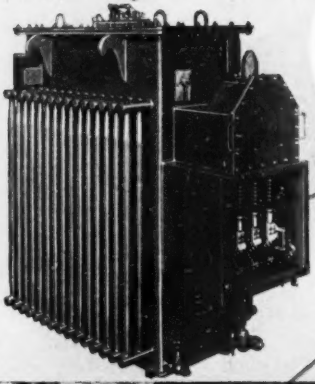


DRY TYPE
Natural and Forced Air Cooled

1000 KVA, 3 phase,
80°C. rise
Class B Insulation
4160Y—480 Δ volts

NETWORK
Submersible and Vault type

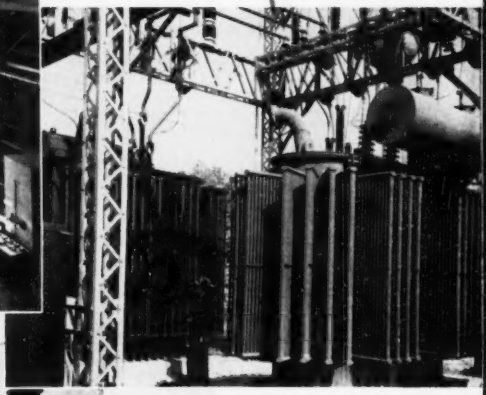
500 KVA,
3 phase,
60 cycles
7200/12,470Y-
208Y/120

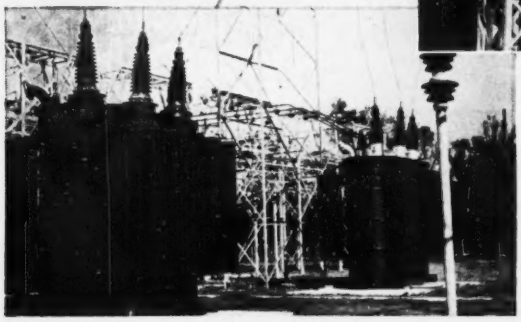


Pennsylvania TRANSFORMERS

The TRADE

View of Main Assembly floor at Pennsylvania's modern plant in Canonsburg, Pennsylvania.



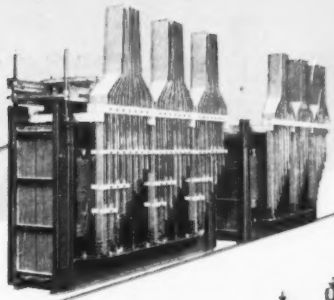


ONE 5000 KVA and ONE 7500 KVA, 3 phase, 60 cycles, OA. 33,000 Δ — 2400/4160Y volts.

TWO 7500 KVA Pennsylvania Transformers, 3 phase, 60 cycles, OA. 115,000Δ—13,800Y/8000 volts.

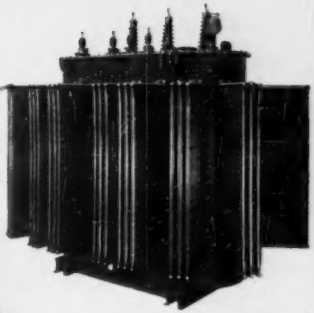
FURNACE
For operating Electric Arc Furnaces as large as 75 tons.

2—10,000 KVA, 3 phase, 60 cycles, OIWC.



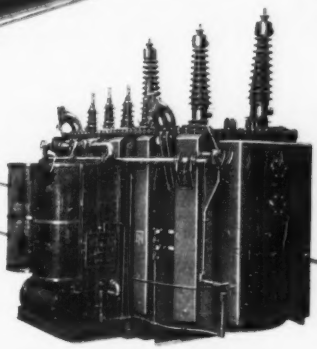
POWER
667 KVA to 50,000 KVA
Up to 230,000 volts.

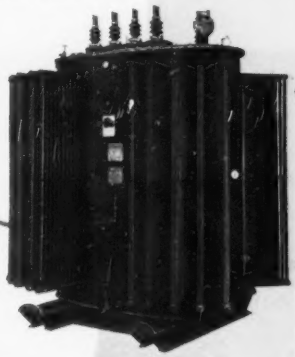
Detachable Radiators
15,000 KVA, 3 phase, 69,400Y— 13800 Δ volts



LARGE POWER
Forced Oil Cooled

30,000 KVA, 3 phase, 132,000— 25,000 volts





STANDARD PARTS POWER
Up to 10,000 KVA
Up to 34.5 KV

3750 KVA, 3 phase, OA, 12,000 Δ — 4160Y volts

MARK that represents

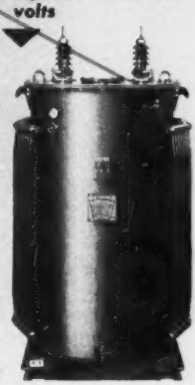
a distinguished product to the electrical world

Sound management, thorough knowledge of the product, and good workmanship is earning Pennsylvania Transformer Company an honored place in the Electrical World. Modern equipment and over ½ million square feet of efficiently arranged floor space enables Pennsylvania's 1100 men and women to concentrate on building good, reliable transformers. A special Planning Department, devoting all of its time to research and development work, promotes improvements such as those incorporated into Pennsylvania's Pole Star and Standard Parts Power Transformers.

TOMORROW, as TODAY, the Pennsylvania trade mark will continue to represent the finest in transformers.

DISTRIBUTION
3 KVA to 500 KVA
Up to 46,000 volts.

500 KVA, single phase, 60 cycles, OA 14,400—240x480 volts



The POLE STAR

100 KVA and below 14,400 volts and below, conforming to E.E.I.-NEMA Standards

Pennsylvania
TRANSFORMER COMPANY
CANONSBURG, PENNSYLVANIA
Greater Pittsburgh District

We invite you to write for Pole Star Catalogs No. 349 and 1049. Also ask for Pennsylvania Standard Parts Power Transformer Booklet No. 1492.

Pennsylvania's complete line of transformers includes: Askarel Transformers, Unit Substation Transformers, Portable Unit Substation Transformers, and Pipe Welding Transformers.

Allis-Chalmers Protects Link-

5 kv Vertical-lift switchgear units with *Ruptair* circuit breakers. These units are standardized and easy to install.

Link-Belt's Ewart plant manufactures power transmission and conveyor chains. All power for the Ewart plant flows through Allis-Chalmers high voltage switchgear.

Switchgear Belt Production

Six 600 Ampere and One 1200 Ampere Ruptair Circuit Breakers in Standard Type HJ 5 kv Switchgear Units Insure Continuous Power to Modern Link-Belt Ewart Plant.

LINK-BELT PRODUCTS are used wherever the wheels of industry turn. Link-Belt's Ewart plant, Indianapolis, Ind., the world's largest plant for the manufacture of power transmission and conveyor chains, produces famous Link-Belt silent and roller chains. Here, many separate manufacturing operations—machining, blanking, trimming, stamping, molding, melting, heat treating, drawing, tumbling, grinding, polishing, assembling—require continuous electric power.

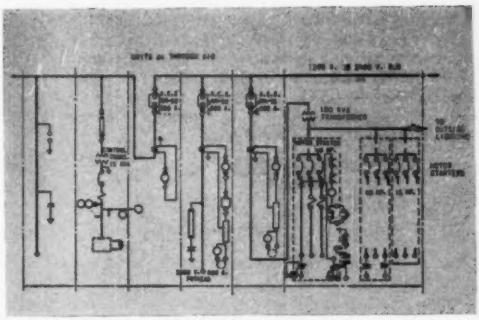
It is easy to remove *Ruptair* Circuit Breakers from a A-C Vertical-lift metal-clad switchgear.

All the power for the Ewart plant flows through Allis-Chalmers high voltage switchgear. Power at 13,200 volts is stepped down by means of three 2000 kva single phase Allis-Chalmers transformers to 4160 volts and fed through 600 and 1200 ampere Allis-Chalmers type HJ 5 kv Vertical-lift switchgear units.

NEEDS ONLY ROUTINE INSPECTION

"We have had no outage except for periodic routine inspections." What better proof of reliable performance of Allis-Chalmers switchgear than this statement by a L-B plant official?

In addition to planning and engineering of this switchgear, Allis-Chalmers provides the follow-up servicing so important in giving undivided responsibility that means better switchgear performance.



Circuit diagram of the Link-Belt Ewart plant.

With today's increasing demand for electric power, utilities and industries need better power protection. For a *sure* answer, look into the advantages of Allis-Chalmers standardized switchgear.

Easy to install. All-steel enclosed. Safety-engineered. Breakers mechanically trip-free. These features add up to give you the most in economical power protection. Call your nearby Allis-Chalmers district office or write direct.

Switchgear House and three Allis-Chalmers 2000 kva transformers.

Ruptair is an Allis-Chalmers trademark. A-2812

ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

First in the U.S. with Metal-Clad Switchgear

how GOOD can PLANNED LIGHTING be without good equipment?

THE answer is—no better than a building plan without good building material. There is no dodging the fact that Good Equipment is the BASIC factor in a GOOD LIGHTING PLAN. It is the lighting units, the lampholders, the ballasts, the reflector, etc., which MAKE or BREAK the final results, in terms of sustained lighting efficiency, low-cost maintenance and dependable operation.

That's why, no matter how good the Lighting Plan, the results may be disappointing unless the plan includes GOOD EQUIPMENT.

the PUBLIC must be BETTER INFORMED on the importance of GOOD lighting equipment

As an industry, and as individual business men, we fail in selling PLANNED LIGHTING when we do not sell the importance of GOOD EQUIPMENT at the same time. It is our obligation that we keep faith with our customers by giving them the UNVARNISHED FACTS about the DIFFERENCE between GOOD and INFERIOR or SUBSTANDARD EQUIPMENT in terms of the factors listed below.

The buyer is entitled to KNOW these facts and to be TOLD and SHOWN that there are POSITIVE PROTECTIONS provided by the lighting industry, which assure him that the equipment he buys is in the GOOD EQUIPMENT BRACKET . . . the QUALITY BRACKET. *Proof of Quality* in lighting equipment is MADE EASY through such proof elements as:

CERTIFIED BALLAST LABEL

RLM LABEL

UNDERWRITERS' LABORATORIES LABEL

ELECTRICAL TESTING LABORATORY TESTS

These provide the buyer not only with the assurance that MINIMUM STANDARDS for performance have been met, but also that UNIFORM QUALITY is continuously maintained from one piece of equipment to the other.

FREE Booklet . . . The RLM Standards Institute has published a booklet containing the detail of each specification for each type of lighting unit for which RLM Standards have been established, as well as a complete summary of the IMPORTANCE OF THE LABEL in terms of CUSTOMER BENEFITS.

How the RLM Label provides assurance that the equipment is of uniformly high quality is shown through an outline of the RLM CONFORMANCE PROGRAM. Under this program, the Electrical Testing Laboratories make periodic tests of samples obtained from factory or market place to make sure that all equipment bearing the RLM Label consistently and continuously adheres to RLM Standards.

Make the RLM BOOKLET a part of every Planned LIGHTING PROPOSAL! . . . Write to the RLM Standards Institute for your COMPLIMENTARY COPY (or copies) of the RLM SPECIFICATION BOOKLET *today*. Plan to attach a copy to every PLANNED LIGHTING proposal you submit . . . let it help you point out to your customers that GOOD EQUIPMENT is BASIC to GOOD PLANNED LIGHTING.

the PUBLIC is entitled to KNOW these FACTS about GOOD LIGHTING EQUIPMENT

CONSTRUCTION: Good Lighting Equipment features structurally sound fabrication and heavy steels for maximum resistance to sag, distortion and breakage.

FINISH: Good Lighting Equipment features reflector finishes that insure your getting all the light you pay for . . . this year and ten years from now! That is why good equipment so overwhelmingly features PORCELAIN ENAMEL—the one and only commercially available finish that cannot deteriorate or corrode, regardless of the industrial atmosphere. Additional advantages of Porcelain Enamel are (1) that it is the only finish whose original efficiency can be sustained year after year by simply washing it with soap and water, and (2) that it is UNSURPASSED as a reflecting surface, because it ideally combines a high reflection factor with a high diffusion factor, insuring high light output with a minimum of glare.

REFLECTOR DESIGN: Good Lighting Equipment insures good lighting through reflector design that conforms to the most accepted principles of Illuminating Engineering. Such design protects the workers' eyes while delivering, not only the *most light* per dollar, but also the *required quality of light* for the individual Seeing Task.

SOCKETS, STARTERS, LAMPHOLDERS: Good Lighting Equipment features ruggedly constructed parts that withstand years of use and embody special design which facilitates quick, money-saving maintenance and low-cost operation.

BALLASTS: Good Lighting Equipment insures you against trouble by employing only the highest quality certified ballasts. Ballasts last longer because sound electrical and mechanical design prevents high temperature ballast operations. Lamps last longer because certified ballasts supply proper starting current and maintain proper operating watts to the lamp. Present wiring capacity is used most efficiently by the high power factor of quality ballasts.

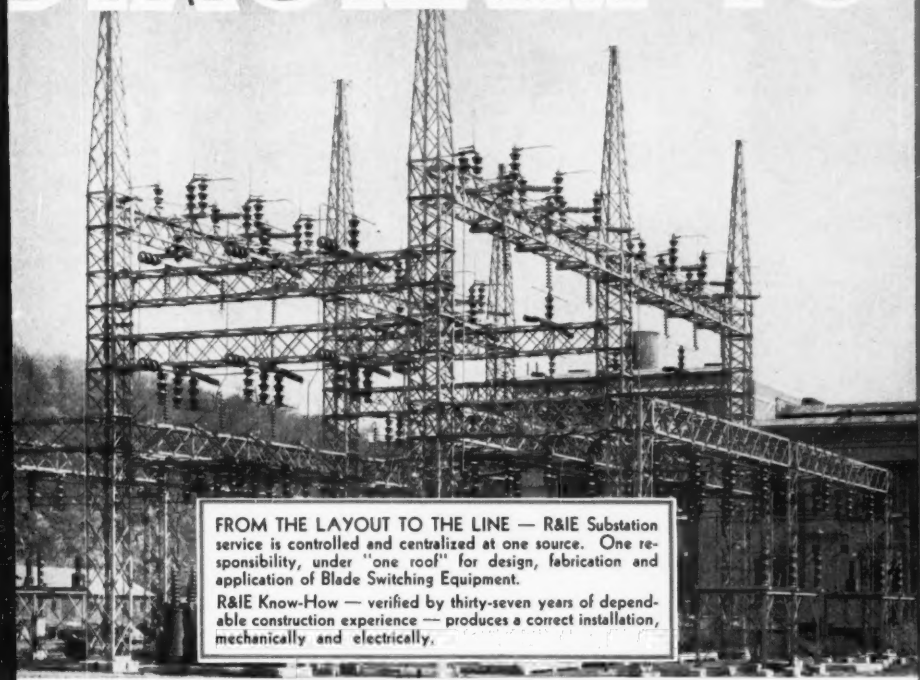
This Advertisement is published in the Interest of the Entire Lighting Industry by

RLM STANDARDS INSTITUTE
INCORPORATED

The letters RLM stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE, SUITE 821, 326 W. MADISON ST., CHICAGO 6, ILL.

DIAGRAM TO



FROM THE LAYOUT TO THE LINE — R&IE Substation service is controlled and centralized at one source. One responsibility, under "one roof" for design, fabrication and application of Blade Switching Equipment.

R&IE Know-How — verified by thirty-seven years of dependable construction experience — produces a correct installation, mechanically and electrically.

DELIVERY

RAILWAY AND INDUSTRIAL ENGINEERING COMPANY, GREENSBURG, PA.

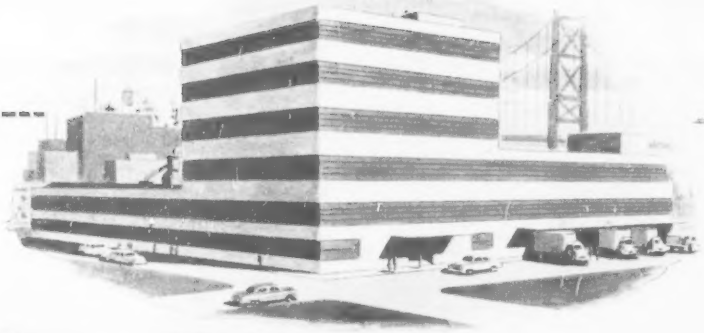
IN CANADA—EASTERN POWER DEVICES, LIMITED, TORONTO

The Check List

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SWITCHING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



Imagine . . . 10,000 KW for the "gang's" favorite field!

. . . it was a perfect place for the "gang's" ball games. Batting power was all *they* required. Now a new factory replaces their ball diamond. *It* requires lots of power . . . dependable power . . . 10,000 kw.

Could YOUR present system economically handle new loads such as this?

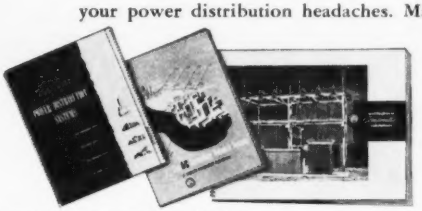
Perhaps you would find it difficult. In the past years, many factors have prevented you from realizing a "perfect system".

But *today* you can plan for that "perfect system". *Future* load growth can then be easily accommodated.

System planning will eliminate many of your power distribution headaches. Make every replacement or extension a part of this planning. Then, as old equipment is replaced, your *planned system* will economically "pay off".

How can Westinghouse help?

Our engineers have worked with all types and sizes of utilities throughout the country. They have helped solve power distribution problems of all kinds. This nationwide experience will enable them to assist you in your planning. Call your nearest Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-97139



YOUR "Know-How" Put to Work

One of the many ways in which Westinghouse feels it can help you in your problem is to crystallize and formulate the best thinking on "System Planning" that has been done in this field to date.

"Electric Utility Power Distribution Systems", B-3905—made possible by *your* co-operation, explains and classifies typical systems for *all* types of areas.

"Co-ordinated Substation", B-4061—presents a complete standardized line of substation designed and manufactured to answer any *system* requirement.

"A-C Secondary Network Systems", B-4002—is the complete story of a system that has saved the utilities at least $175,000,000.

ASK FOR A PRESENTATION OF THIS VALUABLE INFORMATION

Westinghouse

SYSTEM PLANNING SERVICE

PROOF - *not Guesswork*

Makes FWD America's Foremost Heavy-Duty Truck

Here's actual operating proof by one of the nation's leading utilities. This FWD is speeding over the highway to location. Yes — the power and speed you need to get to the job quickly and safely are built into every FWD. Here's why you know this even before you buy. Every FWD built-to-Code Unit must pass a gruelling 50-mile road test on FWD's proving ground before it leaves the factory. *No wonder over 200 of the nation's top utilities use FWDs — with individual fleets up to 192 units!*

WHAT FWDs DO ON THE PROVING GROUND
1 Highball over hilly curved roads!
2 Slog thru mud — up to the bumper!
3 Speed over 100-ft. unbanked circle!
4 Twist over ditches — 18 inches deep!
5 Drive up 6% grade thru 3-ft. of sand!
6 Climb 70% grade from dead stop!
7 Climb 8-in. beam from standstill!
8 Drill pole holes to prove equipment!
9 Speed safely over level highways!
1
2
3
4
5
6
7
8
9

This is FWD's proving ground. This is your assurance that the FWD you select has the stamina to insure long life without expensive mechanical breakdowns.

An FWD takes the 50-mile road test at the proving ground. For all the facts about FWD Built-to-Code Units, see your Graybar distributor — or write FWD.

An Invitation To Truck Buyers

We invite you to watch FWDs pass a series of rigid performance tests. Ask your FWD distributor to arrange your visit to our plant. Or — if you can't get away, ask him to show you the movie, *The FWD Story*. In either case, you will see for yourself how FWD trucks can help solve your heavy-duty trucking problems.

Martin G. Otte
President
The Four Wheel Drive Auto Company

U-2

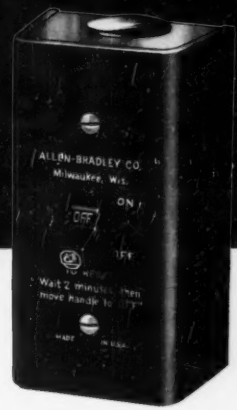
THE FOUR WHEEL DRIVE AUTO COMPANY
Clintonville, Wis. • *Canadian Factory:* Kitchener, Ontario
FOUR AND SIX WHEEL DRIVE TRUCKS

America's Foremost Heavy-Duty Truck

BULLETIN 600...

The Popular Starter for Machines Using Motors of 1 Hp or Less

Designed for Modern Requirements

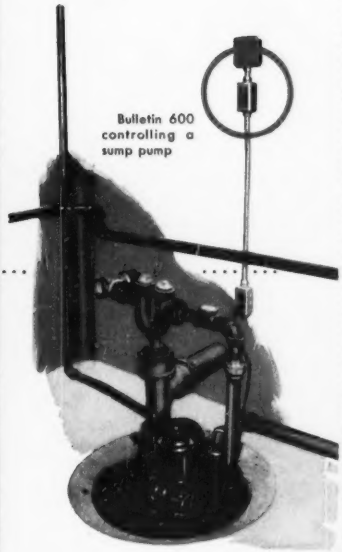


This reliable snap switch starter has been redesigned—inside and out—to provide more wiring space . . . more accessible terminals . . . and a far more attractive appearance on your machine.

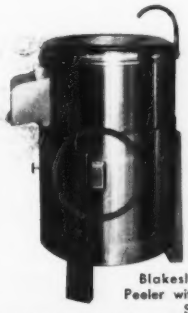
Meets N.E.C. requirements and is a sales asset on any motorized machine.

Bulletin 600 mounted on a Famco Power Press

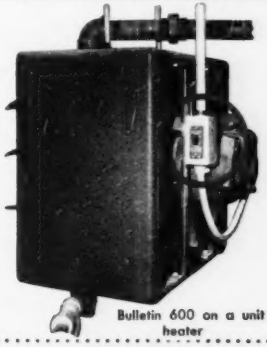
Triumph Cookie Dropper with Bulletin 600



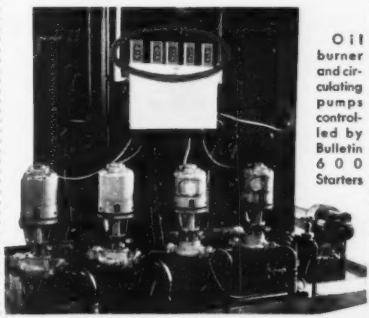
Bulletin 600 controlling a sump pump



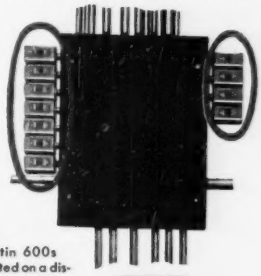
Blakeslee Vegetable Peeler with Bulletin 600 Starter



Bulletin 600 on a unit heater



Oil burner and circulating pumps controlled by Bulletin 600 Starters



Bulletin 600s mounted on a distribution panel

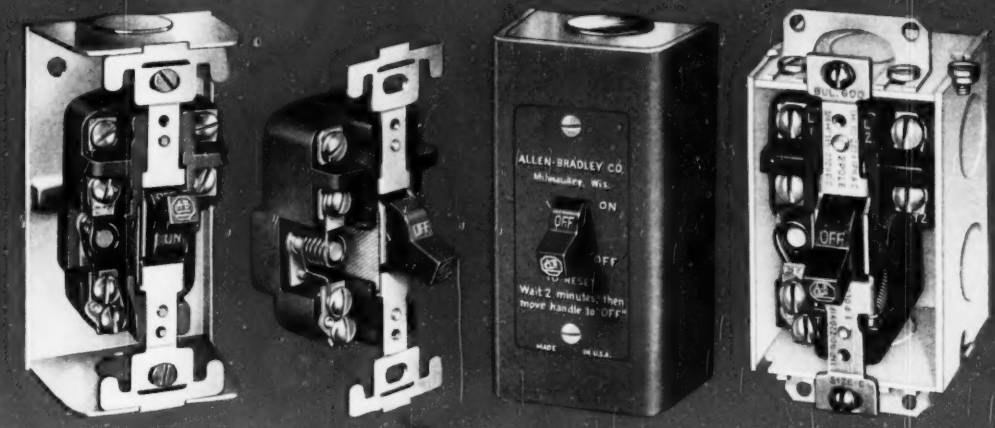
ALLEN-BRADLEY

STARTING SWITCHES FOR SMALL MOTORS

QUALITY

A-B Quality

ALLEN-BRADLEY CO.
1316 S. Second Street
Milwaukee 4, Wis.



Open view of enclosure for surface mounting.

Switch unit without enclosure for machine bases.

Closed view of enclosure for surface mounting.

Bulletin 600 Switch fits into any standard switch box.

Starting Switches with Overload Protection for Fractional Horsepower Motors

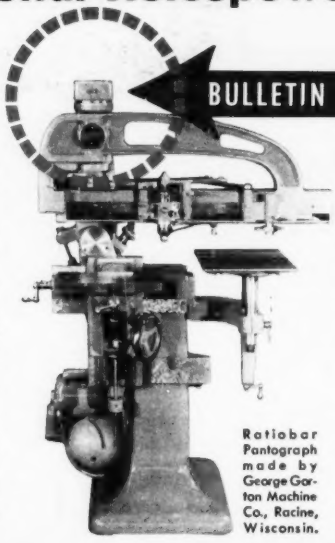
BULLETIN 600 STARTING SWITCH

To satisfy the latest ruling of the National Electrical Code... which requires overload protection for many fractional horsepower motor applications... the Bulletin 600 Starting Switch is the popular answer.

Its self-contained thermal breaker is always dependable. Long periods of inactivity will not affect its accuracy. At the first sustained overload... the switch trips... and the motor is protected against burnout.

Waterproof Enclosure.

The Bulletin 600 Starting Switch cannot be held closed until the overload condition is corrected. This compact control unit is a sales asset to any machine.



Ratiobar Pantograph made by George Gorton Machine Co., Racine, Wisconsin.

Above is shown how easily the Bulletin 600 Fractional Horsepower Starting Switch fits into the standard Allen-Bradley enclosure or into any standard switch box.

The switch unit can also be mounted in any suitable cavity in the machine frame.

For locations requiring enclosures to operate in wet or hazardous locations, there are several standard A-B enclosures to meet every service requirement.

Bulletin 600 Switches are available with pilot lights, selector switches, and other accessories. Send for complete data, today.

ALLEN-BRADLEY

QUALITY

BULLETIN 600 STARTING SWITCHES

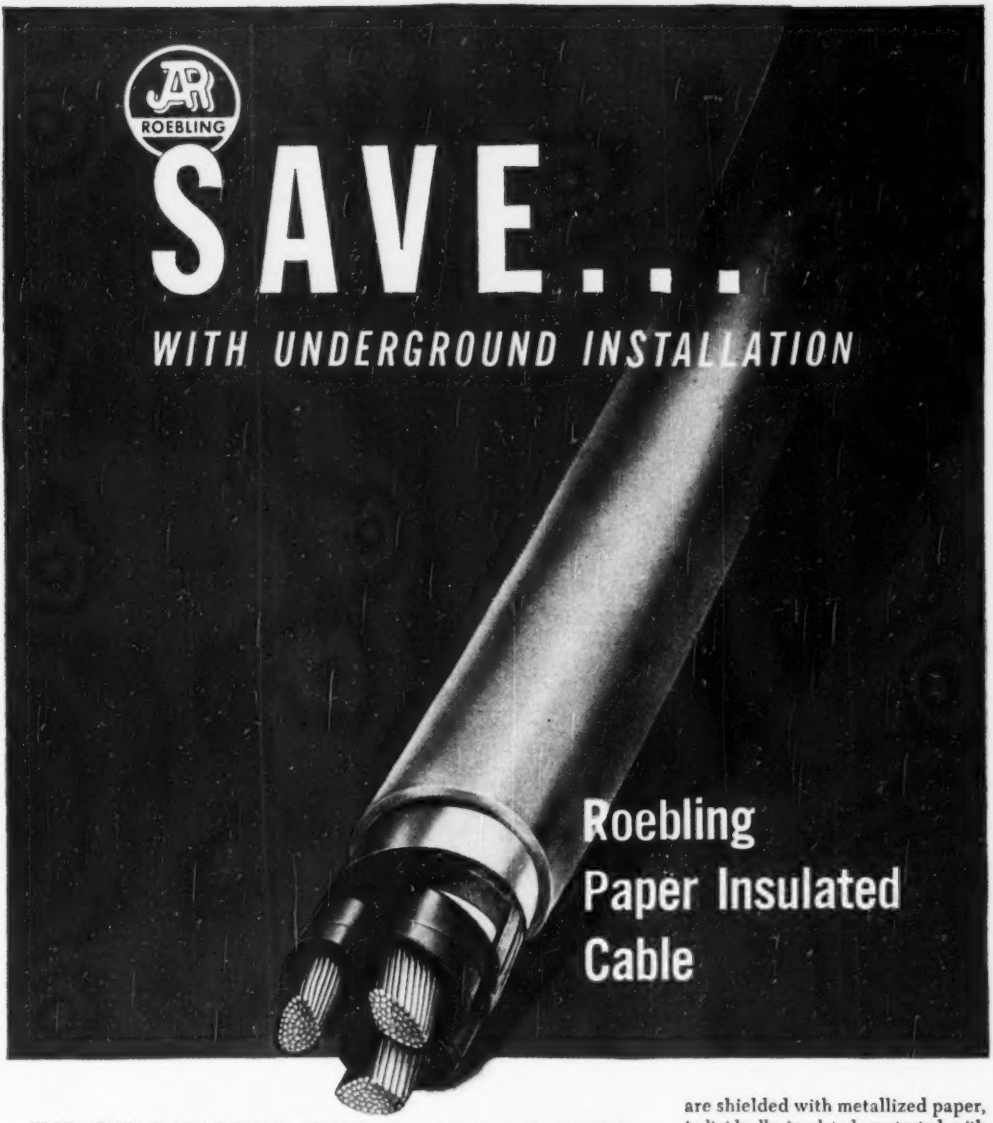
A-B Quality

Allen-Bradley Co.
1316 S. Second Street
Milwaukee 4, Wis.

JR ROEBLING

SAVE...

WITH UNDERGROUND INSTALLATION



YOU WIN WHEN YOU ABOLISH OVERHEAD LINES

YOU'VE EVERYTHING TO GAIN and nothing to lose (except costly maintenance and eyesores) when you abolish overhead lines. Today's best practice is to put circuits underground . . . and to install Roebling Paper Insulated Lead Encased Cables for long, uninterrupted service at lowest cost.

Roebling Shielded Type H is outstanding for 3-phase grounded neutral circuits from 13 to 33 kv. It comes in both single and multiple conductor construction, in regular and Compack strand (round or sector). Conductors are shielded with metallized paper, individually insulated, protected with perforated copper shielding tape, and then the whole assembly served with a bronze binder tape and lead sheathed.

Your nearest Roebling office and sales engineer will be glad to help you choose the *right* cable for your specific service. John A. Roebling's Sons Company, Trenton 2, New Jersey.

WRITE OR CALL THE ROEBLING FIELD MAN AT YOUR NEAREST ROEBLING OFFICE AND WAREHOUSE

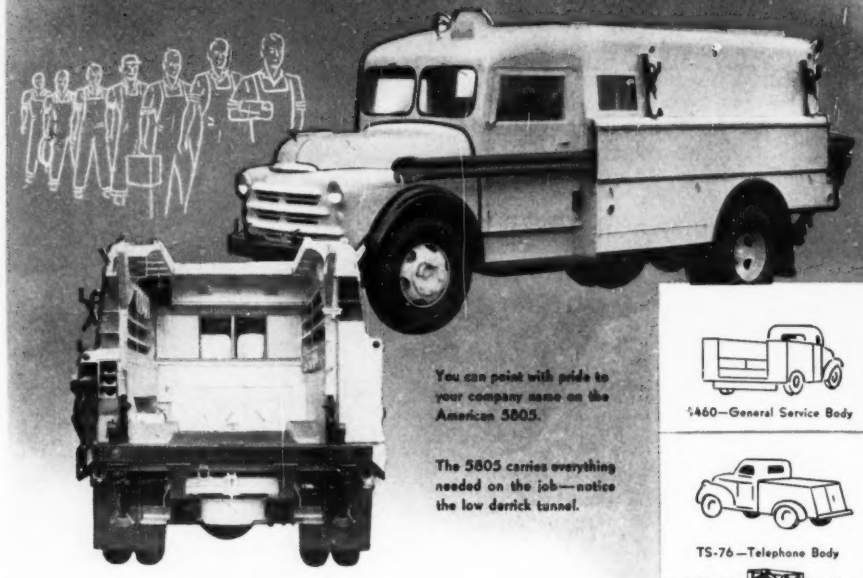
Atlanta, 934 Avon Ave. ★ *Boston*, 51 Sleeper St. ★ *Chicago*, 5525 W. Roosevelt Rd. ★ *Cleveland*, 701 St. Clair Ave., N. E. ★ *Denver*, 1635 17th St. ★ *Houston*, 6216 Navigation Blvd. ★ *Los Angeles*, 216 S. Alameda St. ★ *New York*, 19 Rector St. ★ *Philadelphia*, 12 S. 12th St. ★ *Pittsburgh*, 855 W. North Ave. ★ *Portland, Ore.*, 1032 N. W. 14th Ave. ★ *San Francisco*, 1740 17th St. ★ *Seattle*, 900 First Ave.

ROEBLING

☆ *A CENTURY OF CONFIDENCE* ☆

American 5805

7-MAN CREW COMPARTMENT LINE CONSTRUCTION BODY



You can point with pride to your company name on the American 5805.

The 5805 carries everything needed on the job—notice the low derrick tunnel.

460—General Service Body

TS-76—Telephone Body

Hydraulic Tower Lift

B-4 Crew in Body

DPL Line Construction Body

designed for extra wide hood and fender lines

Crews like the idea of a 7-man compartment, integral with body. Good visibility, ventilation and padded seats add to crew comfort. Cab easily accessible from both sides of body. Hinged front seat permits easy entrance to rear seat. Streamlined compartment utilizes space available on the current wide models of truck chassis.

Body is exclusive American line construction design with a place for ladders, pike poles, derricks and the dozens of other items (large and small) needed on the job. Available in basic length of 138 inches.

This 7-man crew compartment body, replacing Model 3714, has been a long-time favorite with light, gas, water, telephone, municipalities and contractors.

Ask The American Coach & Body Company about Model 5805, streamlined for the extra wide hood and fender lines.

THE American COACH & BODY COMPANY

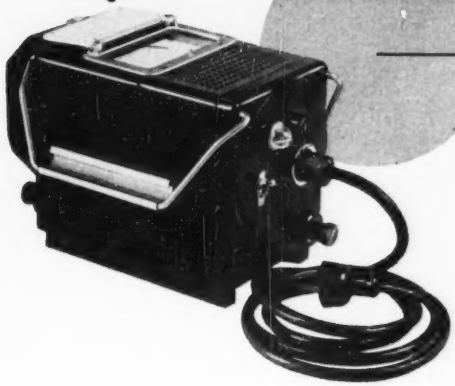
MAIN OFFICE AND PLANT — 9503 WOODLAND AVE., CLEVELAND 4, OHIO
CALIFORNIA DIVISION — 432 FIFTH STREET, OAKLAND 7, CALIFORNIA

SALES OFFICES: INSURANCE EXCHANGE BLDG. DES MOINES 9, IA. · 207 LAKE STREET MONROE, N. Y. · HEALEY BLDG. ATLANTA, GA.

DISTRIBUTORS: BAKER EQUIPMENT ENGINEERING CO SUMMIT & NORFOLK STS. RICHMOND 11, VA. · EQUIPMENT SERVICE, INC. 1 WAWARME AVE. HARTFORD 6, CONN.

ACB and

NEW "MEGGER"* Rectifier-Operated Insulation Testers

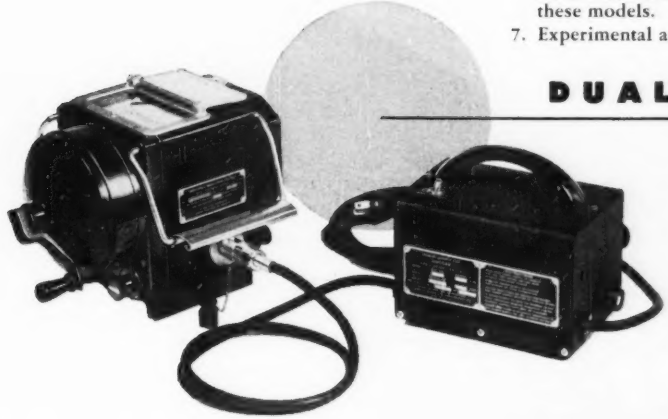


RECTIFIER-OPERATED

. . . in which a transformer and rectifier replaces the usual hand-cranked generator. It operates simply by plugging into 115 v. 60 cycles.

Typical Applications include:

1. Production testing of all types of electrical equipment and components.
2. Testing multi-conductor communication cables, as in telephone plants.
3. Testing multi-conductor control circuits in power plants.
4. Acceptance tests, such as from load centers, in lighting and power installations.
5. Testing multi-conductor control and power circuits at central locations in railway signal installations.
6. Testing generators, cables and other equipment by the time-resistance method, where the dielectric absorption or leakage current of the insulation under test is high enough to bring the resistance measurement within the range of these models.
7. Experimental and laboratory use.



DUAL-OPERATED

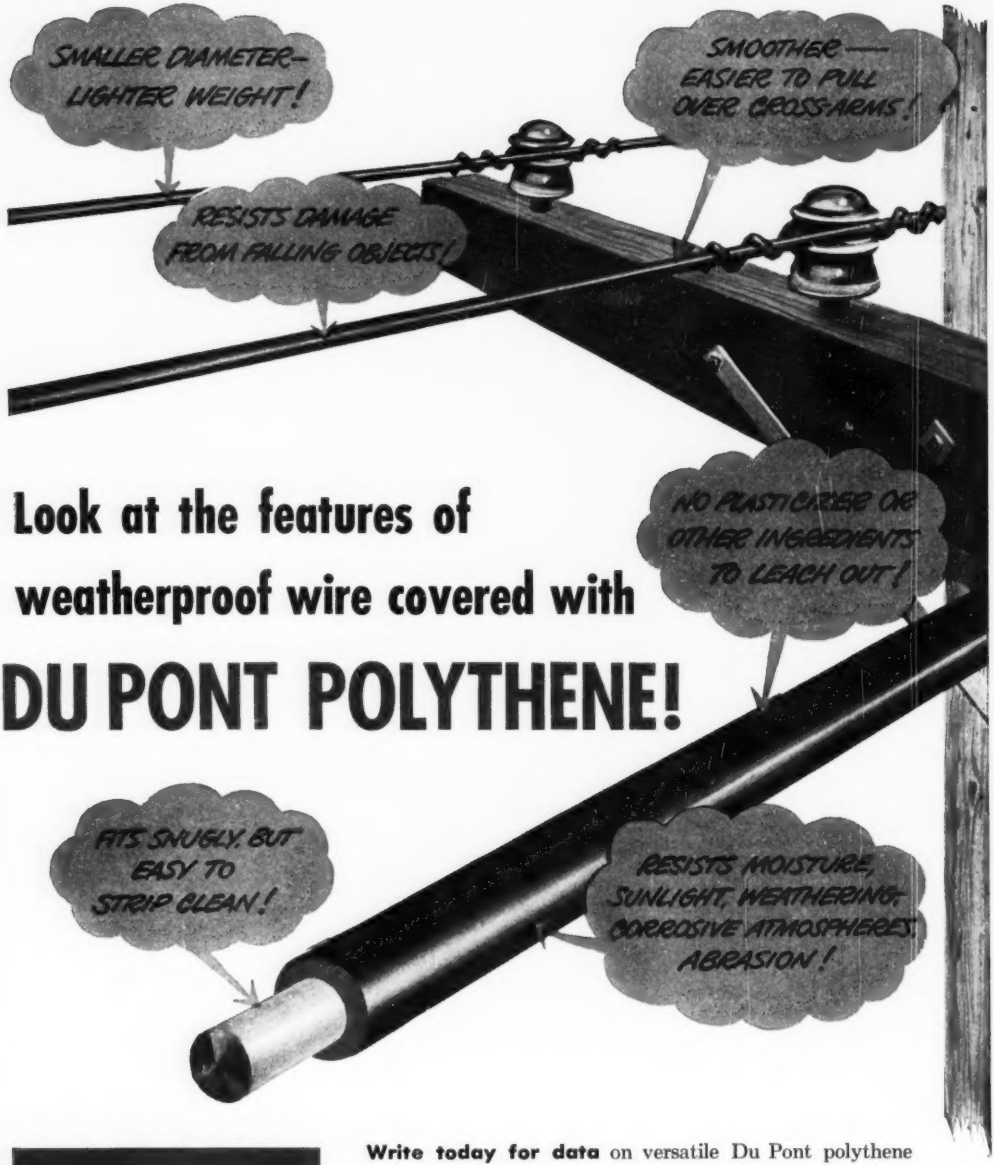
. . . a combination of the popular, constant-voltage, hand-cranked set, and a separate rectifier. It can be operated either by hand or by the rectifier connected to 115 v. 60 cycles. This Dual-Operated instrument has the same applications as the instrument above, *plus* the fact that the basic, hand-cranked instrument is available for test problems normally encountered in the field.

• *For full particulars please write for new illustrated Bulletin 21-46-W.*

*REG. U. S. PAT. OFF.

JAMES G. BIDDLE CO.
Electrical & Scientific Instruments
1316 ARCH STREET, PHILADELPHIA 7, PA.

"Megger" INSULATION TESTERS • GROUND TESTERS • OHMMETERS

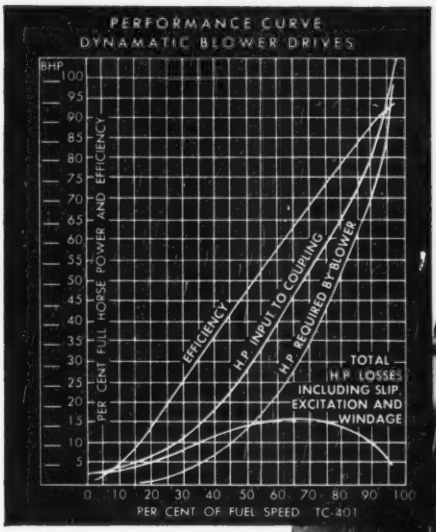

SMALLER DIAMETER—LIGHTER WEIGHT!
SMOOTHER—EASIER TO PULL OVER CROSS-ARMS!
RESISTS DAMAGE FROM FALLING OBJECTS!
NO PLASTICIZER OR OTHER INGREDIENTS TO LEACH OUT!
FITS SNUGLY, BUT EASY TO STRIP CLEAN!
RESISTS MOISTURE, SUNLIGHT, WEATHERING, CORROSIVE ATMOSPHERES, ABRASION!

Look at the features of weatherproof wire covered with DU PONT POLYTHENE!

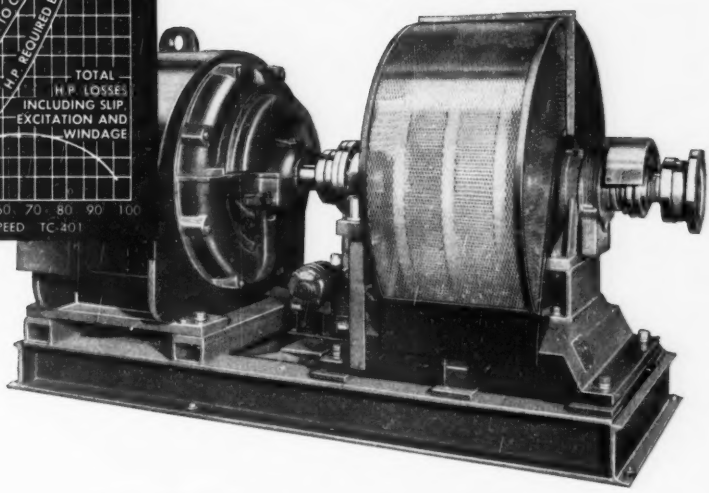
DU PONT
REG. U.S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Write today for data on versatile Du Pont polythene plastic! Easy to mold, extrude and fabricate . . . offers a remarkable combination of properties to the electrical industry. E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept., Main Sales Offices: Empire State Bldg., New York 1, N. Y.; 7 South Dearborn St., Chicago 3, Ill.; 845 East 60th St., Los Angeles 1, Calif.

Line wire covered with Du Pont polythene made by Anaconda Wire & Cable Co., N. Y. C.; Phelps Dodge Copper Products Corp., Yonkers, N. Y.; Rome Cable Corp., Rome, N. Y.


PERFORMANCE CURVE
DYNAMATIC BLOWER DRIVES
BHP
PER CENT FULL HORSE POWER AND EFFICIENCY
EFFICIENCY
H.P. INPUT TO COUPLING
H.P. REQUIRED BY BLOWER
TOTAL H.P. LOSSES INCLUDING SLIP, EXCITATION AND WINDAGE
0 10 20 30 40 50 60 70 80 90 100
PER CENT OF FUEL SPEED
TC-401

EATON DYNAMATIC BLOWER DRIVES



Instantaneous Response to Speed Control

Dynamatic Variable Speed Couplings are ideally adapted to such applications as regulating air drafts in steam generating stations, power house fan drives, public utility induced draft fans, and forced draft fans. Controls can be made to change the output speed of the coupling and hold that speed constant. Response is instantaneous and load changes are closely followed. The speed range available is practically infinite, and can be controlled precisely from ten per cent speed up to full speed.

The performance curve above indicates the characteristics of Dynamatic couplings when driving fans or blowers. Fundamentally, all fans and blowers will have curves very close to the ideal curves shown in this figure. Note the desirable relationship between efficiency, horsepower input, and required horsepower. The horsepower losses indicated are normal for this type of application. Both air cooled and water cooled types of Dynamatic couplings are available, selection depending upon loads and type of service involved. The electric-slip coupling was developed and introduced by Dynamatic; this company has pioneered the use of electric-slip couplings in fan and blower drive applications. Write for illustrated literature.

EATON MANUFACTURING COMPANY • CLEVELAND, OHIO
ADDRESS INQUIRIES TO: DYNAMATIC DIVISION • KENOSHA, WISCONSIN

PRODUCTS: SODIUM COOLED, POPPET, AND FREE VALVES • TAPPETS • HYDRAULIC VALVE LIFTERS • VALVE SEAT INSERTS • ROTOR PUMPS • MOTOR TRUCK AXLES • PERMANENT MOLD GRAY IRON CASTINGS • HEATER-DEFROSTER UNITS • SNAP RINGS • SPRINGTITES SPRING WASHERS • COLD DRAWN STEEL • STAMPINGS • LEAF AND COIL SPRINGS • DYNAMATIC DRIVES, BRAKES, DYNAMOMETERS

Choose One Type of Power Cable... Use it Three Ways

Pick Durasheath for power distribution: small size or large . . . one, two or three conductors . . . to carry from 0 to 5,000 volts. Then use this type in any installation you like: buried directly in the ground . . . in conduit . . . suspended from poles . . . or in a run that includes all three. Following are some of the characteristics of Durasheath that give it this versatility:

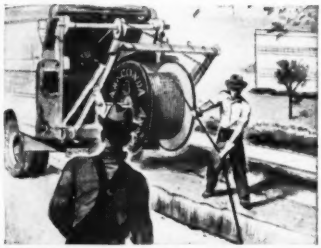
Durasheath is *unaffected by electrolysis*, corrosion and extremes in temperature.

High resistance to oil, flame, abrasion, cutting, impact and the moisture, acids and alkalies found in the soil.

Light weight – greater strength.

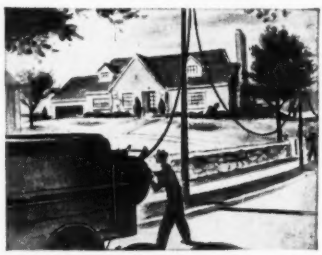
More flexible, easier to handle.

For power distribution between industrial plants, in street lighting systems, airports, mines, railroad signal systems, farm buildings and real estate developments – to mention a few – use Durasheath, the all-purpose cable. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.



UNDERGROUND. Toughness of neoprene jacket assures long life of Durasheath when installed directly in the ground.

IN DUCT. Moisture, oil, acid resistance of neoprene jacket make Durasheath an ideal cable for this application.



IN THE AIR. In single or multi conductors, Durasheath truly is a one-type cable for all-type use.

Anaconda **Durasheath**

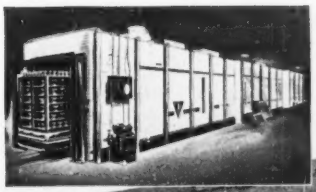
ANACONDA

THE ALL-PURPOSE CABLE

Craftsmanship and Modern Engineering

Result in

VICTOR'S Steady Growth



Kiln No. 4 Completed in 1949

Modernized VICTOR plant with over 300,000 sq. ft. of manufacturing space.

VICTOR'S skilled craftsmen, many of whom have been making high quality insulators at Victor for over forty years, take *pride* in their workmanship. It is this pride, *plus* modern ceramic and electrical engineering, *plus* advanced manufacturing equipment that have brought about Victor's steady growth.

The addition of another oil-fired tunnel kiln early this year has enabled Victor to step up the production of its high voltage porcelain insulators—insulators famous for their superior, *on-the-job performance*. And with its large modern factory, Victor is now better equipped than ever to fill your standard or special porcelain requirements.

Specify VICTOR for quality and dependable deliveries.

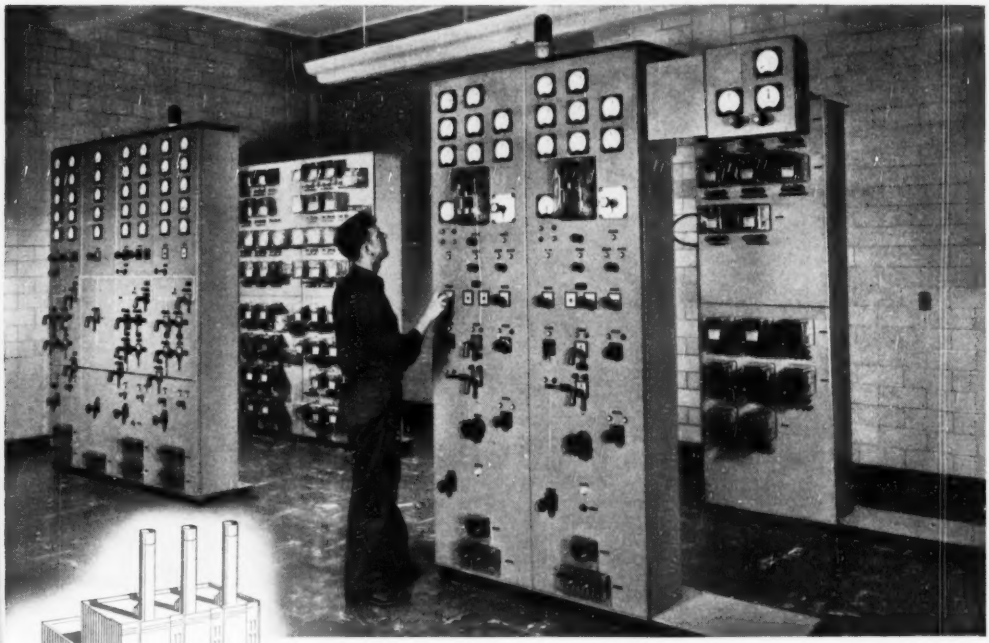
VICTOR INSULATORS Inc.
VICTOR, NEW YORK

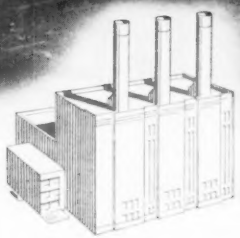
Look for this trade mark of enduring service

V

YOU CAN BE **SURE**.. IF IT'S

Westinghouse





Instruments "Check-Rein" 240,000 Horsepower!

When the power load builds up and up, it's Westinghouse Instruments that give the tip-off! Another generator is called into action—steady voltage flows over the network . . .

This is a familiar routine at the new B. C. Cobb Station, owned by Consumers Power Company. This modern steam electric generating plant, located on the shores of Lake Muskegon, Michigan, has a rated capacity of 180,000 kw, or 240,000 horsepower. Westinghouse Instruments have been standardized on here—keep a vigilant watch over power that is generated at 14,400 volts, then transformed to 22,000, 44,000 and 140,000 volts.

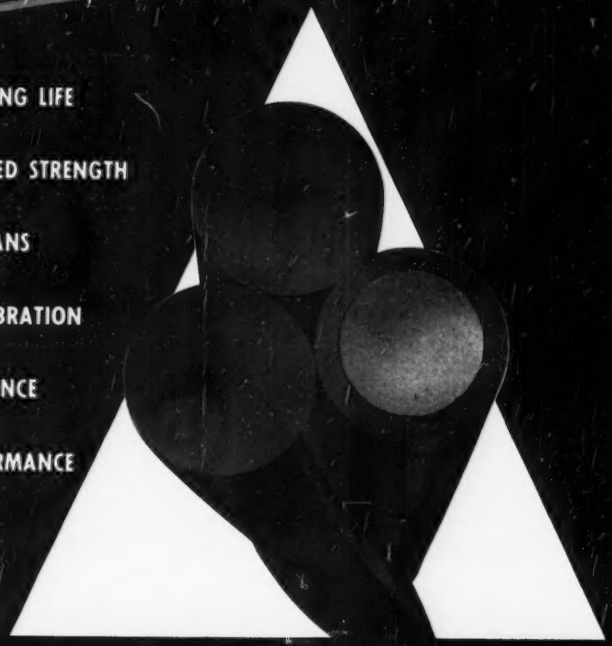
Serving as the "eyes" for this massive power system calls for instrument reliability to the nth degree. We believe Westinghouse Instruments meet this challenge. *You can be sure* of the complete line of Westinghouse Instruments—from calling the turn on a microamp. to keeping a "check-rein" on all the concentrated horsepower America's genius can devise.

Westinghouse Instrument Specialists are available in the field for consultation. Call your nearest Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40379

Westinghouse INSTRUMENTS

GET THESE *proved advantages-*

- LONG LIFE
- RUGGED STRENGTH
- LONG SPANS
- MINIMUM VIBRATION
- HIGH CONDUCTANCE
- DEPENDABLE PERFORMANCE
- OVERALL ECONOMY



Copperweld-copper

TRADE MARK

DEPENDABLE CONDUCTORS

MADE BY

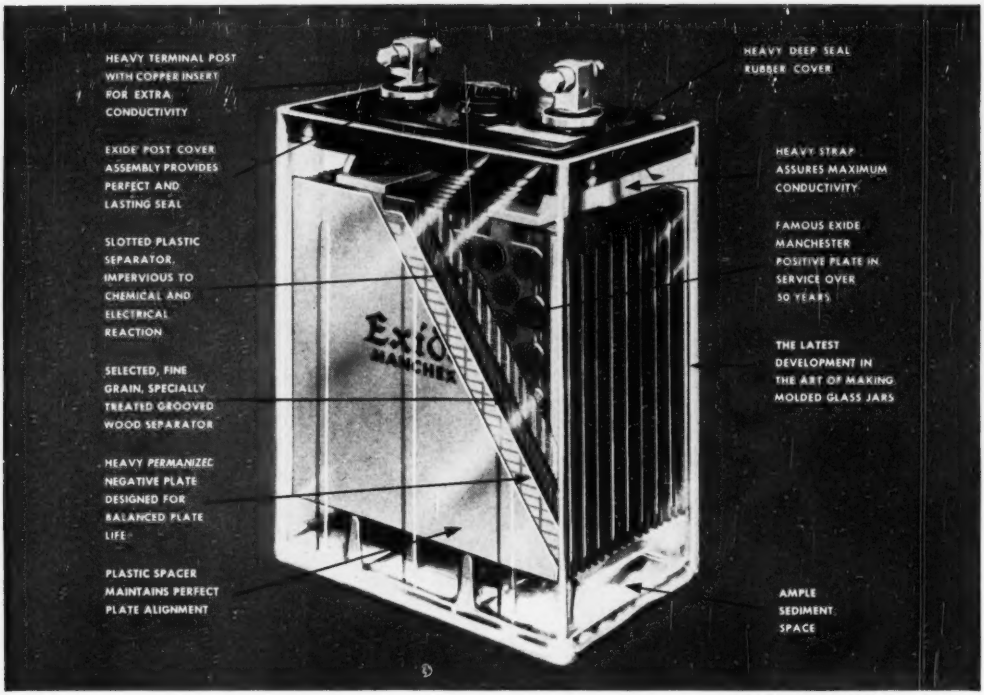
COPPERWELD STEEL COMPANY

GLASSPORT, PA.

SALES OFFICES IN PRINCIPAL CITIES

NEW-EXIDE-MANCHEX battery

for dependable SWITCHGEAR SERVICE


HEAVY TERMINAL POST WITH COPPER INSERT FOR EXTRA CONDUCTIVITY
EXIDE POST COVER ASSEMBLY PROVIDES PERFECT AND LASTING SEAL
SLOTTED PLASTIC SEPARATOR, IMPERVIOUS TO CHEMICAL AND ELECTRICAL REACTION
SELECTED, FINE GRAIN, SPECIALLY TREATED GROOVED WOOD SEPARATOR
HEAVY PERMANIZED NEGATIVE PLATE DESIGNED FOR BALANCED PLATE LIFE
PLASTIC SPACER MAINTAINS PERFECT PLATE ALIGNMENT
HEAVY DEEP SEAL RUBBER COVER
HEAVY STRAP ASSURES MAXIMUM CONDUCTIVITY
FAMOUS EXIDE MANCHESTER POSITIVE PLATE IN SERVICE OVER 50 YEARS
THE LATEST DEVELOPMENT IN THE ART OF MAKING MOLDED GLASS JARS
AMPLE SEDIMENT SPACE
Exide
MANCHEX

"Exide" *Reg. Trade-Mark U.S. Pat. Off.*

One of its many exclusive features is the famous MANCHESTER POSITIVE PLATES with their unique lead button construction. The buttons—rolled strips of corrugated soft lead—are pressed into holes of the lead-antimony grid. Forming action expands the buttons and locks them securely in place. Only a comparatively small portion of the total lead is formed initially into active material . . . the balance is available for gradual conversion in service.

THE PERMANIZED NEGATIVE PLATES are constructed of a lead-antimony grid, or framework, with a series of vertical ribs connected by short horizontal bars. Bars are flush with plate surface . . . extend only part way through the plate . . . are staggered on opposite sides. The active material . . . sponge lead . . . is formed of vertical strips or ribbons that extend from top to bottom of the plate between the vertical ribs and is locked in place by the horizontal bars. The new EXIDE-MANCHEX BATTERY has a high, 1 minute rating. It will provide up to 100% more capacity in the same given space.

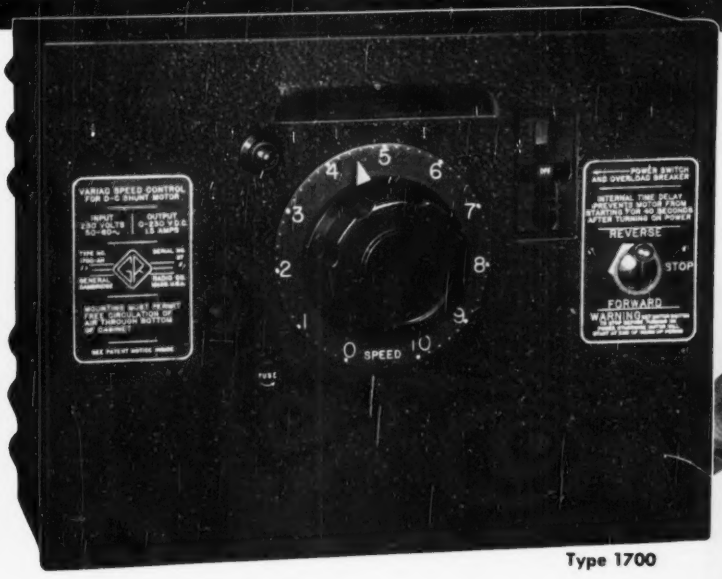
LONG LIFE...LOW MAINTENANCE COST...IMPROVED ELECTRICAL CHARACTERISTICS...INCREASED POWER (watt) OUTPUT PER UNIT OF SPACE...LESS WEIGHT PER AMPERE HOUR OUTPUT...ATTRACTIVE INSTALLATION

Exide
BATTERIES

1888 — Dependable Batteries for 61 Years — 1949

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • *Exide Batteries of Canada, Limited, Toronto*

NEW Motor Speed Controls for D-C Motors from A-C Lines



Type 1700

Type 1701

These New General Radio *VARIAC** *Speed Controls Feature*

- Operation of 1/3 and 1/4 h.p. d-c shunt or compound, 1/20 h.p. d-c shunt and 1/20 h.p. universal motors, from A-C LINES
- Continuously-variable Speed Ranges of Over 15 to 1
- Extremely fast Starting — Large Overload Capacity
- Fast Stopping — Dynamic Braking (on 1/3 and 1/4 h.p. units)
- Extremely Fast Reversing
- Good Speed Regulation
- Smooth Operation — Less Torque Pulsation
- Straightforward Circuit
- All Controls and Circuits in One Small, Easily Mounted Box
- For Use with STANDARD D-C Motors, No Derating Necessary

*Trade Name VARIAC is Registered at the U. S. Patent Office

Variac Speed Controls

TYPE	FOR USE WITH D-C MOTOR OF	A-C LINE	PRICE
1700-AL	1/3 or 1/4 h.p. shunt or compound wound	105-125 volts (50-60 cycles)	$175.00
1700-AH	ditto	210-250 volts (50-60 cycles)	175.00
1701-AK	1/20 h.p. shunt wound	105-125 volts (60 cycles)	65.00
1701-AU	1/20 h.p. Universal	105-125 volts (60 cycles)	65.00

For complete data write for:
VARIAC MOTOR CONTROL BULLETIN

GENERAL RADIO COMPANY Cambridge 39, Massachusetts

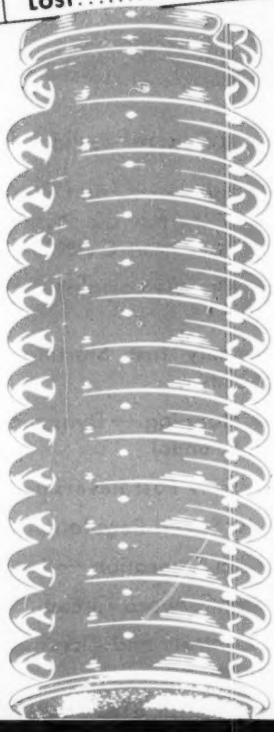
90 West St., New York 6 920 S. Michigan Ave., Chicago 5 1000 N. Seward St., Los Angeles 38

Do You Know The Odds?

WHAT HAPPENS WHEN FLASHOVER KNOCKS OFF A PETTICOAT?...

PIN-TYPE	SUSPENSION	LINE POST
FLASHOVER DISTANCE LOST..... 16%	FLASHOVER DISTANCE LOST..... 68%	FLASHOVER DISTANCE LOST..... 1%
LEAKAGE DISTANCE LOST..... 32%	LEAKAGE DISTANCE LOST..... 83%	LEAKAGE DISTANCE LOST..... 7%

HOW many insulators do *you* have to replace in an average year because of flashover damage alone? Actual records *prove* that the replacement rate on Lapp Line Posts is only 1% to 10% that of other insulators. That's because Lapp Line Posts are built for punishment. Flashover attack that would shatter ordinary insulators breaks off one or two petticoats at the most, leaving Lapp Line Posts' body *intact*, flashover and leakage distances only negligibly decreased, essential efficiency *unimpaired*. Small wonder that service records invariably show that *lines on Lapp Line Posts have fewer outages, require fewer replacements and less maintenance than comparable lines on any other type of insulator*. The odds are all on your side when you build your transmission lines on Lapp Line Posts... for maximum performance, maximum economy. Lapp Insulator Co., Inc., LeRoy, N. Y.



PERFORMANCE IS PROOF

Lapp INSULATORS

McCABE-POWERS AUTO BODY CO., 5900 N. Broadway, St. Louis 15, Mo.

Please furnish us literature on the following Powers Bodies:

☐ Service Bodies ☐ Meter Installation
☐ Construction and Maintenance Bodies

Special Equipment

☐ Forestry Bodies ☐ Pole Trailers ☐ Compressor Bodies
☐ Aerial Ladders ☐ Winches ☐ Pole Derricks

Company_____

Individual_____ Title_____

Street Address_____

City_____ State_____

before you buy any utility bodies for 1950

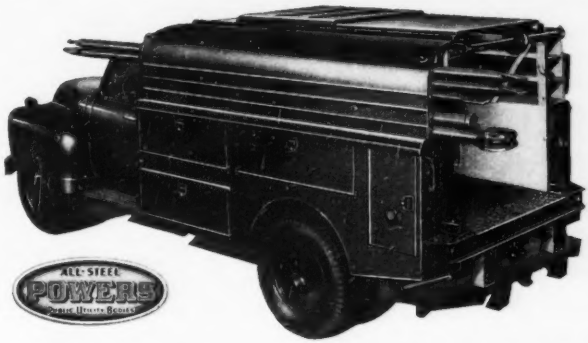
Look—

AT THE FEATURES YOU GET IN

POWERS

PUBIC UTILITY BODIES

- Electrically welded all steel construction.
- Recessed slam action handles with cylinder locks.
- Extra large compartments with shelving and partitions for materials, tools and supplies.
- Triple-seal weathertight compartment doors.
- Saf-T Rolled Edges on all shelves and partitions.
- Remountable on new chassis.
- Clean Functional Design.



MAIL US the coupon above now for complete literature on POWERS' Public Utility Bodies for 1950! We'll send you informative material which thousands of utility men are finding very helpful in deciding on new equipment for next year's operation. Thus you can enter your 1950 budget conferences with the kind of data your management finds most useful in making equipment decisions! Thousands of POWERS' Public Utility Bodies are in use on large and small construction, maintenance and service operations. That's why POWERS is a favorite "buy-word" in the field today. You'll find them highly popular with line crews, who are enthusiastic about their efficient design, special features, ease of handling and many work-saving conveniences. Vitally important, your management will be impressed with POWERS' competitive pricing, as well as the economy of operating and maintaining these "work horses" of the public utility field. Contact us for full information—*mail the coupon above now!*

Delivery when you want it!

POWERS

PUBIC UTILITY BODIES

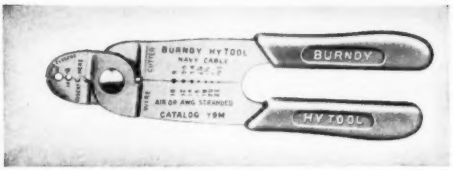
"Bodies for '50!"

McCABE-POWERS AUTO BODY CO. • 5900 NORTH BROADWAY • ST. LOUIS 15, MISSOURI

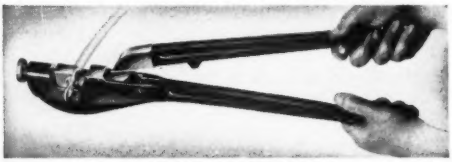
Tools that replace the Torch...

Burndy Hydraulic Hypress—Y34-A. Hand-operated—weight 9 lbs.; 18,000 lbs. pressure; for conductors No. 6 through 500 Mcm. Used to install Hylugs, Hylinks, Hytaps and overhead Hysplices.

BURNDY
Hytools and Hypresses



Burndy All-Purpose Hytool—Y9M. Hand plier with wire cutter and stripper. For conductors No. 22 through No. 10.



Burndy Hytool MY29. Hand-operated—for conductors No. 8 through 4/0 without change of dies.

Burndy Hydraulic Hypress—Y34-B. Foot-operated type; 18,000 lbs. pressure; for conductors No. 6 through 500 Mcm.

WHY fuss with solder when making electrical connections? Efficient, rapidly operated Burndy HYTOOLS and HYPRESSES indent one-piece, pure copper HYDENT connectors onto all conductors from #22 through 2000 Mcm.

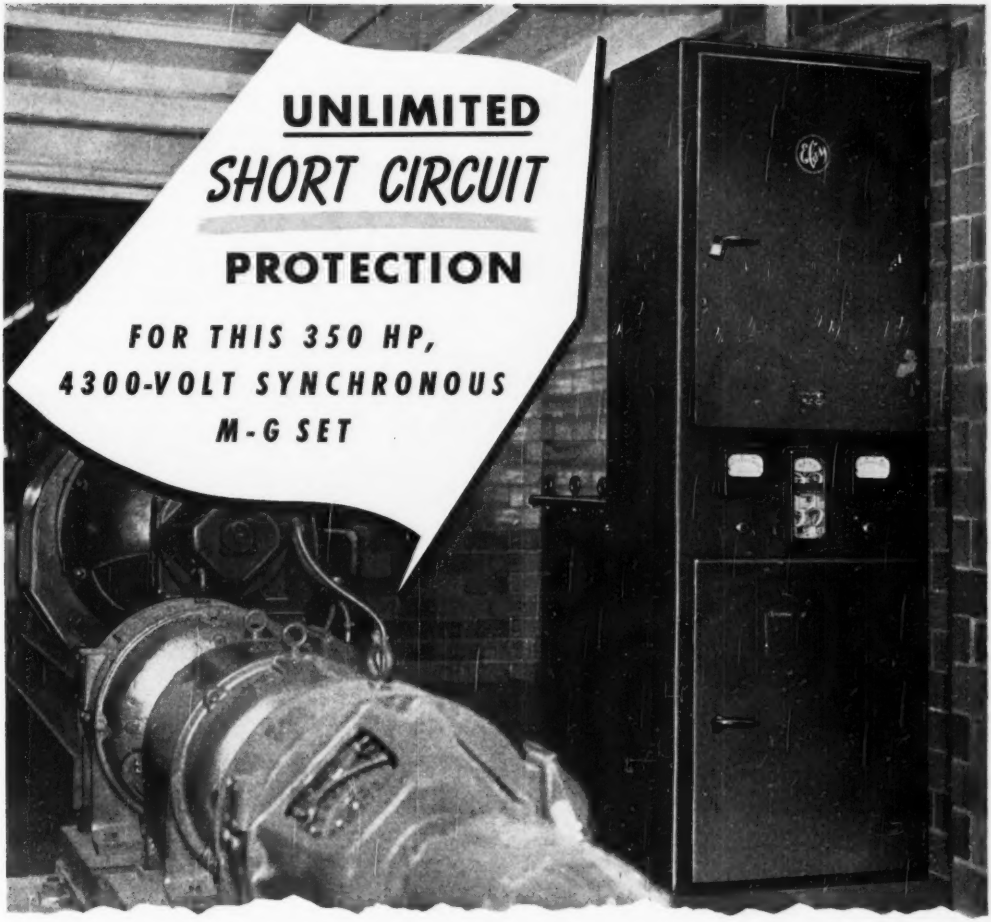
With this modern HYDENT connecting method you assure uniform depth of indent, and *strong, efficient electrical connections, every time.* But more, you make substantial savings on *every* connection. You just insert the conductor into the connector barrel, and indent with the HYTOOL. *Nothing simpler . . . nothing quicker . . . nothing surer!*

No matter what your requirement, Burndy has the right tool for your connecting needs . . . hand, portable or bench types; manual, hydraulic or pneumatic operation. Get all the facts. Send for Burndy HYDENT Catalog Y46 today.

Hylugs—Hylinks—Hysplices are a few of the many Hydent connectors.

Connect with
BURNDY

New York 54, N. Y.
WESTERN BRANCH: Vernon 11, California
CANADA: Burndy Canada Ltd., Toronto 8



with EC&M VALIMITOR (Volt-Ampere-Limitor) STARTER

There's no ceiling on VALIMITOR protection because fault currents are limited to a maximum of 25,000 KVA (steady state current) and the well-known Type ZHS Contactor used in these starters clears such faults quickly.

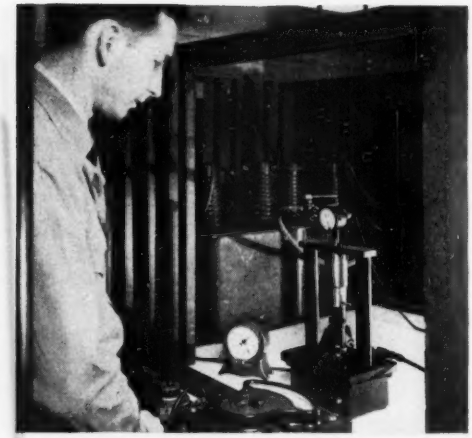
Because protection is unlimited—there's no need for calculating existing short circuit capability—no need to fear that these starters will be out-moded by future growth in KVA.

Also there are no fuses to replace after a fault. Protection is permanent, today and forever.

Write for **COMPLETE FACTS - ASK FOR No. 23 ACCELERATOR BULLETIN**

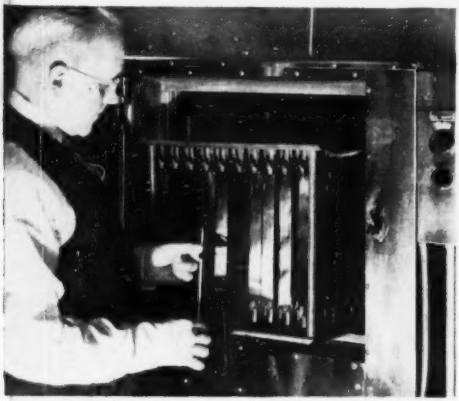
THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79TH STREET ★ CLEVELAND 4, OHIO

If you need but are cramped for space



Samples from each lot are tested for dielectric strength and are required to withstand 1000 volts per mil at room temperature.

Hot oil test. Varnished cambric is subjected to a severe heating test—hot petroleum at 150°C. for a period of 15 minutes. After cooling the varnished coating must not be softer nor more tacky than before immersion.



Precisely controlled ovens subject varnished cambric to aging tests far in excess of normal requirements.

The cambric tape is critically examined for gauge, thread count and tearing strength. Tensile strength lengthwise must not be less than 3000 psi.

more power

—use American Varnished Cambric Cables

Maximum power, minimum size, lower costs and ease of installation—these are the chief advantages of U·S·S American Varnished Cambric Cables.

● How to get the most power from the smallest cable is a problem continually being faced by electrical engineers. The improved varnished cambric wires and cables offer a happy solution in many cases.

The varnished cambric used by American Steel & Wire Company is being recommended for operating temperatures up to 85°C. (185°F.). In this respect it is notably superior to rubber . . . permits greater current carrying capacity. It also has higher dielectric strength which results in cables of smaller outside diameter. In multiple conductor cables, part of the insulation may be applied in the form of a belt, thus reducing outside diameter still further. These features permit varnished cambric cables to carry substantially more power for their size than rubber insulated cables.

The fact that oil and grease do not damage varnished cambric insulation makes it widely used for motor and generator leads, transformers, regulators and oil circuit breakers. It is particularly desirable for heavy power lines in power plants, factories and mills.

With the protection of a lead sheath, (Type PS Strand Shielding used over 2KV) varnished cambric can be used where continuous exposure to moisture is expected. Combined with asbestos insulation, it can be used for extremely hot locations.

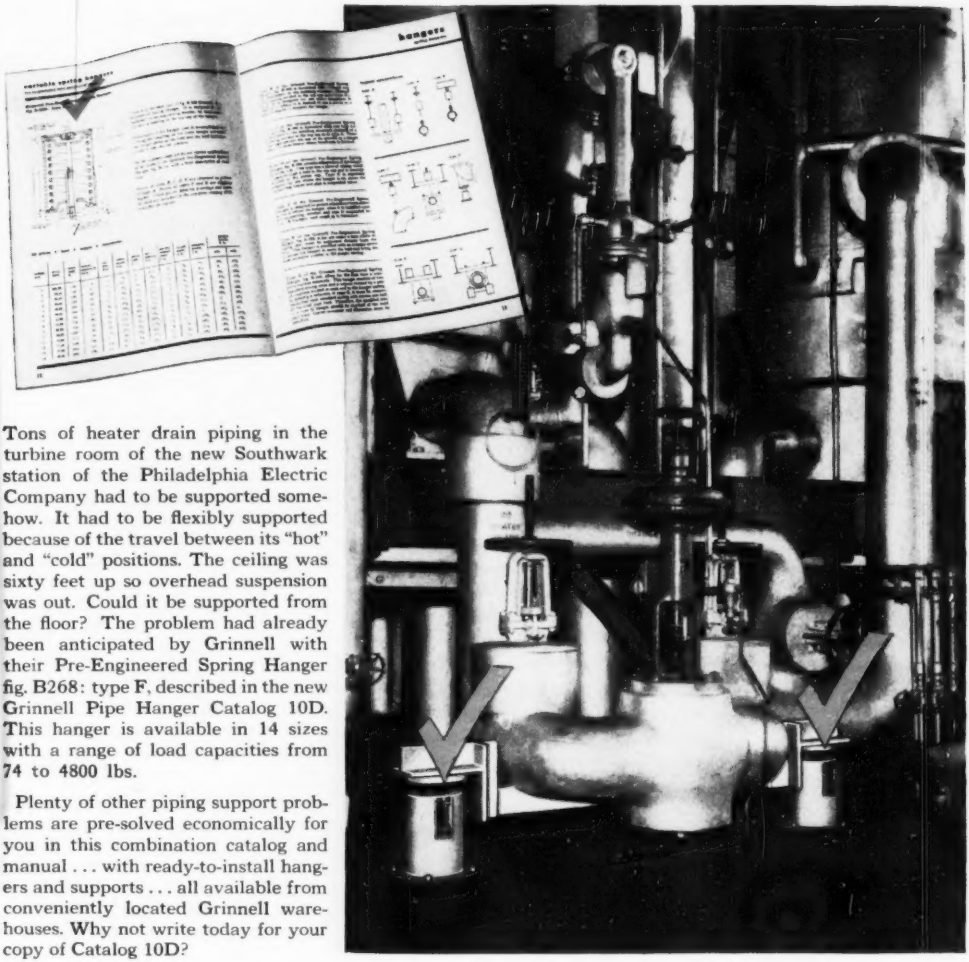
For complete information on the many types of U·S·S American Varnished Cambric Cables, write for our technical booklet.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS American Varnished Cambric Wire and Cable

UNITED STATES STEEL

The problem was "special" but the solution came "out of stock"



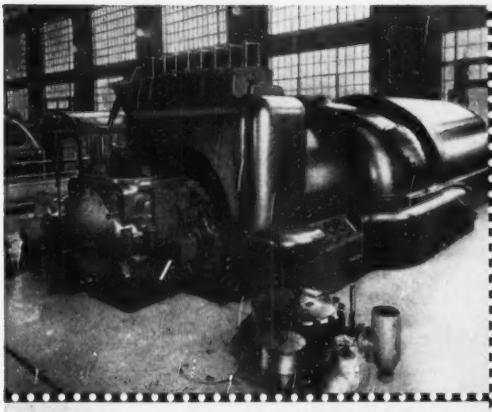
Tons of heater drain piping in the turbine room of the new Southwark station of the Philadelphia Electric Company had to be supported somehow. It had to be flexibly supported because of the travel between its "hot" and "cold" positions. The ceiling was sixty feet up so overhead suspension was out. Could it be supported from the floor? The problem had already been anticipated by Grinnell with their Pre-Engineered Spring Hanger fig. B268: type F, described in the new Grinnell Pipe Hanger Catalog 10D. This hanger is available in 14 sizes with a range of load capacities from 74 to 4800 lbs.

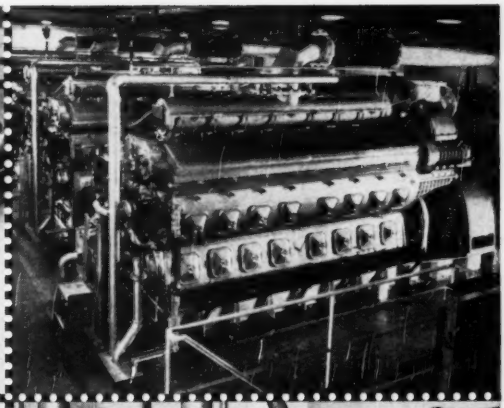
Plenty of other piping support problems are pre-solved economically for you in this combination catalog and manual . . . with ready-to-install hangers and supports . . . all available from conveniently located Grinnell warehouses. Why not write today for your copy of Catalog 10D?

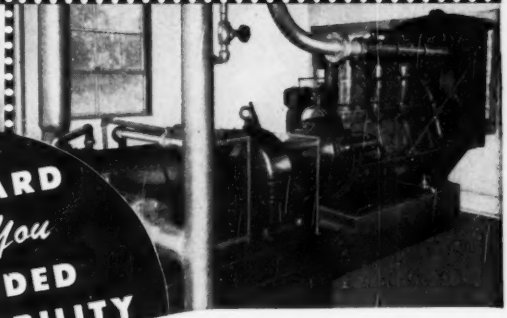
99 YEARS PIPING

GRINNELL

Grinnell Company, Inc., Providence, Rhode Island. Branches: Atlanta • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston Long Beach • Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Philadelphia • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane







PRITCHARD *Offers You* **UNDIVIDED RESPONSIBILITY CONTRACTS** in the Construction of Power Generating Stations, Alterations and Extensions

Pritchard's

SINGLE RESPONSIBILITY CONTRACT

includes . . .

- Analysis of Requirements
- Design
- Engineering
- Field Construction
- Purchasing
- Guarantees
- Operating Tests
- Firm prices quoted on a "Turnkey" Basis

Your inquiry is invited.

POWER DIVISION

J.F. Pritchard & Co.

DESIGN • ENGINEERING • CONSTRUCTION

908 GRAND AVE. • KANSAS CITY 6, MO.

J.F. P Co. — THREE FUNCTIONS — Design, Engineering, Construction. FIVE FIELDS — Serving the CHEMICAL, POWER, PETROLEUM and GAS industries as well as providing specialized EQUIPMENT for all industries.

NATIONAL CONSTRUCTORS ASSOCIATION — MEMBER

©1949

HOUSTON • NEW YORK
ST. LOUIS • TULSA • LOS ANGELES • PITTSBURGH • CHICAGO

SUCCESS STORY...

Design Engineers hail new Fiberglas Insulation at price comparable to Cotton

BH "649"

Designers and manufacturers of electrical equipment agree—never before an insulation like this new BH "649" . . . for superior physical and dielectric properties at lower cost.

Production testing has now been completed in scores of plants. Here are some of the results:

(1) BH "649" retains rated dielectric strength even after rough handling and severe bending;

(2) BH "649" stays supple after baking 12 hours at 300°F;

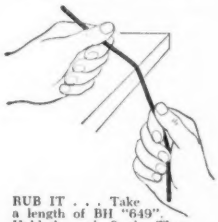
(3) No flowing, softening or blistering after 15 minutes at 425°F.

Reports of savings are common because BH "649" sells at a price comparable to ordinary cotton-base or rayon-base insulations. With BH "649" a less expensive grade of insulation can often be used since there is little or no loss of dielectric strength in assembly or product use.

BH "649" is made in Grades A-1, B-1, C-1 and C-2—in all sizes from No. 24 to 5/8" inclusive. If you haven't tried BH "649" let us send you samples.

BENTLEY, HARRIS MANUFACTURING CO., CONSHOHOCKEN, PA.

KNOT IT . . . Take a length of BH "649". Knot it. Pull it as tight as you can. Twist it. Then loosen the knot. There is no cracking. No change in the dielectric strength.



RUB IT . . . Take a length of BH "649". Hold the ends firmly. Then rub the sample up and down briskly in a sawing motion against the edge of a desk or chair. See how difficult it is to damage the coating.

HOLD A MATCH UNDER IT . . . Take a length of BH "649". Hold a lighted match under it. BH "649" will not support combustion.

BH Fiberglas* SLEEVINGS

COUPON

Bentley, Harris Mfg. Co., Dept. W-37, Conshohocken, Pa.

I am interested in BH "649" Fiberglas Tubing and Sleeving. Send samples for production testing of Grade_____ in sizes as follows _____ (size or I.D.) for _____ (product) operating at temperatures of _____°F. at _____ volts.

NAME _____

ADDRESS _____

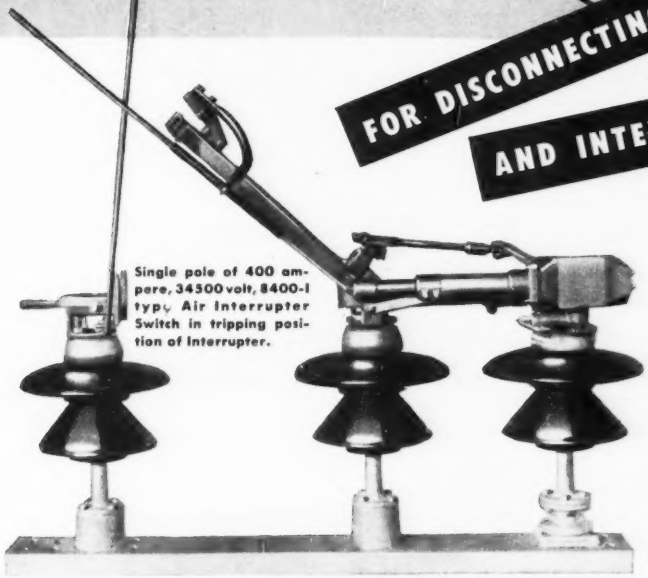
Send samples, pamphlets and prices on other BH Products as follows:

☐ Cotton or Rayon-base Sleeving and Tubing

☐ BH non-fraying Fiberglas Sleeving

3 "E's" DOUBLE DUTY UNIT

FOR DISCONNECTING AND INTERRUPTING



Single pole of 400 ampere, 34500 volt, 8400-I type Air Interrupter Switch in tripping position of interrupter.

INCREASE EFFICIENCY BY INSTALLING THESE TWO FEATURES

The "Three E" Air Interrupter Switches not only provide a highly efficient means of disconnecting and isolating high voltage equipment, but in addition they have interrupting capacity.

The cleverly designed interrupter unit enables this switch to interrupt up to 600 amperes at 46000 volts and up to 200 amperes at 69000 volts.

This unit operates without the use of oil or other outside arc extinguishing mediums and is neat, compact and occupies little space on the main switch.

Because of their greater utility, Air Interrupter Switches can be used for these operations where expensive oil circuit breakers heretofore had been employed.

When you require high voltage switches, why not get the type that gives you the greatest measure of usefulness. **SPECIFY THREE E AIR INTERRUPTER SWITCHES AND GET THE MOST.**

Listed herewith are other operations that can be performed with this type of switch.

1. **Sectionalizing feeder and distribution circuits.**
2. **Interrupting magnetizing current of transformers.**
3. **Interrupting charging current of busses, lines and cables.**
4. **Interrupting exciting current of feeder regulators.**
5. **Switching charging current of capacitor banks.**
6. **Combined with power fuses they present an excellent means of interruption plus fault and short circuit protection.**

Our Bulletin 331 (just off the press) gives complete information on this new type of switch. It is sent gratis.

THREE E — ELECTRICAL ENGINEERS EQUIPMENT CO. — MELROSE PARK, ILL. U.S.A. — THE MARK OF QUALITY

ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILLINOIS

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

PROOF

FROM

ALABAMA

"We eliminated load checks costing $12 a piece"

The way this southern utility uses Westinghouse "CSP"* transformers to eliminate load checks is a prize example of the moneysaving features in these Completely Self-Protecting units.

With many thousand "CSP" transformers on 7,200 volt lines, their records show this comparison:

On conventional transformers, they fused for a minimum of 200% of load, but changed the transformer to a larger size when the load reached 150% of the rating. This load was determined from (1) a specific load check, (2) specific knowledge of added load or (3) records of abnormal fuse outages. It cost $6 to replace a fuse, and approximately $12 to make a load check. Since a transformer would not be changed on just one fuse outage, there was always a minimum total cost of $12 for a load check.

With "CSP" transformers, they use the red signal light as a positive indication that the limit of safe *thermal* loading has been reached.

You can be sure of this: Using "CSP" signal lights instead of making expensive load checks cuts operating costs. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70523

**Trademark—Reg. U. S. Pat. Off.*

WANT MORE FACTS? Here are 36 pages of product information you'll want to have about Completely Self-Protecting transformers. Covers construction, operation, mounting and servicing. Ask for B-4249.

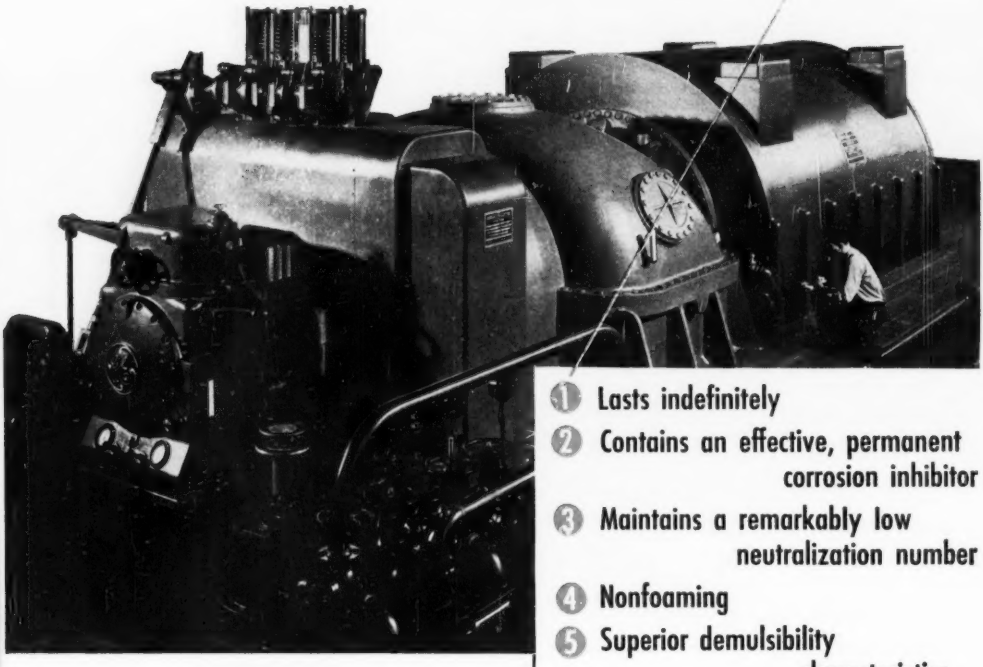
Call the Westinghouse Salesman

Westinghouse "CSP" TRANSFORMERS

SINGLE PHASE THREE PHASE BANKED SECONDARY

5 REASONS

Why Gulfcrest Oil is the logical choice for your new turbine



1. Lasts indefinitely
2. Contains an effective, permanent corrosion inhibitor
3. Maintains a remarkably low neutralization number
4. Nonfoaming
5. Superior demulsibility characteristics

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

Boston · New York · Philadelphia · Atlanta
New Orleans · Houston · Toledo

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company EW
3800 Gulf Building, Pittsburgh 30, Pa.

Please send, without obligation, a copy of your booklet "Gulfcrest Oil for Steam Turbine Lubrication."

Name.....

Company.....

Title.....

Address.....

YOU want all these qualities in the oil you select for your new turbine. You get them all in Gulfcrest, the world's finest turbine oil!

Call in a Gulf Lubrication Engineer today and ask him to give you conclusive evidence that Gulfcrest Oil is the logical choice for your new turbine. Write, wire, or phone your nearest Gulf office —or send the coupon at left.

Any way you look at it, a poor wiring system cuts lighting efficiency . . . causes headaches for plant electricians and maintenance men as well as for production workers.

Improving plant lighting and reducing maintenance costs are important functions of General Electric wiring materials. Exciting new products and a full line of old standbys make General Electric the right choice for every wiring requirement.

1. **NEW G-E REMOTE CONTROL** wiring puts switches for various lights in many convenient locations. Master panel can be located at production head's desk. Banks of switches can also be located at convenient points in the shop for local control. This flexible, new wiring system also permits control of any or all lights from distant locations, such as other offices or a master-control point. The G-E remote control wiring system makes multi-point switching economical and easy to put in.

2. **G-E REMOTE CONTROL WIRE**—lightweight, with two or three conductors—was specially designed for remote control wiring. This trim-looking wire can be installed either concealed or exposed—makes a neat installation when it's run along wall surfaces. It permits remote control switches to be placed practically anywhere. The use of a low-voltage relay makes this small-size wire practical.

3. **AVA POWER CABLE** is a natural for bringing in power to a high-level lighting installation like this. And, when you think of power cables, think of General Electric Deltabeston* cables. They'll save you maintenance grief, because they're built to beat ambient and operating heat. They can help you save space, too, because they are designed to carry more current than ordinary cables of the same size.

*Trade-mark Reg. U.S. Pat. Off.

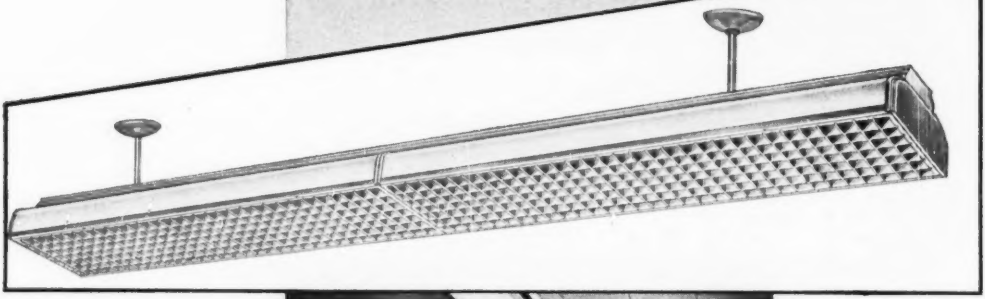
4. **TYPE TW WIRE** is recommended for installation in raceways. Smooth-finished G-E Type TW can be cut and stripped with little effort—pulls through conduit easily when wiring changes are necessary. Small diameter and long life are features of this G-E thermoplastic wire—use it to help your wiring system stay modern.

5. **CONDUIT,** of course, should be General Electric "White"—the rigid conduit that's *hot-dip* galvanized for extra protection. High-grade steel—galvanized inside and out, and lacquer-coated—gives you maximum wiring protection with a minimum of maintenance. Remember to specify "G-E White."

Your distributor of General Electric construction materials can supply you with any of these materials, or with any of thousands of other items from the General Electric line. For more information, contact him, or write to Section K17-1127, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

GENERAL ELECTRIC

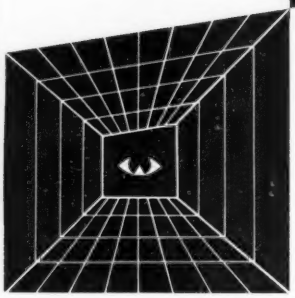
NEW MILLER HARTFORD LUMINAIRE FOR PERFORMANCE...FOR APPEARANCE



The MILLER HARTFORD luminaire is engineered for fine illumination performance. Comes in 4′ and 8′ lengths for general line and slimline fluorescent lamps.

4

Flexibility of application in ceiling or suspension mounting, individually or in continuous rows.



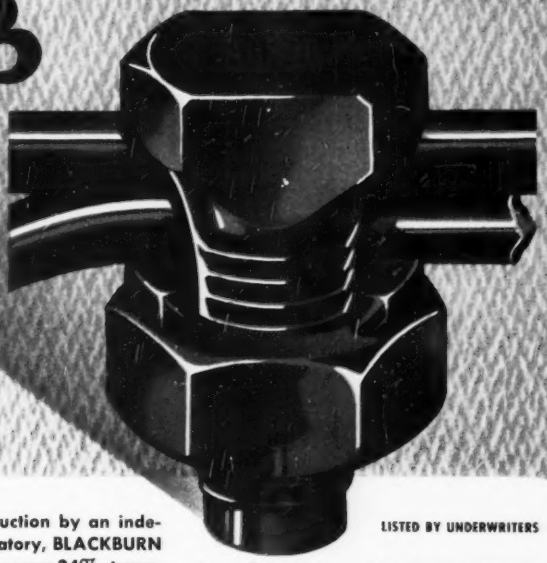
Modern in design—smartly pleasing in appearance—the new Miller HARTFORD Luminaire provides high levels of well-diffused illumination for stores, offices, schools, drafting rooms and public buildings. Reflector enclosures of Lucite, Polystyrene or metal louvers meet varied seeing requirements. Low installation and maintenance costs.

Miller Lighting Service is all-inclusive. It covers the needs of planned industrial and commercial lighting. Miller field engineers and distributors, conveniently located, are at your call. Write or wire for Miller HARTFORD Catalog.

THE miller COMPANY
SINCE 1844
ILLUMINATING DIVISION, MERIDEN, CONNECTICUT
ILLUMINATING DIVISION: Fluorescent, Incandescent, Mercury Lighting Equipment. HEATING PRODUCTS DIVISION: Domestic Oil Burners and Liquid Fuel Devices. ROLLING MILL DIVISION: Phosphor Bronze and Brass in Sheets, Strips and Rolls

BLACKBURN *Hi-Strength* CONNECTORS

TEST 1/3 STRONGER!



LISTED BY UNDERWRITERS

When pulled to destruction by an independent testing laboratory, BLACKBURN Hi-Strength Connectors were 34% stronger than the average of seven other leading makes. They were 14% above the next strongest connector and 62% better than the weakest of the connectors tested.*

Tests also show that Blackburn Hi-Strength Connectors produce a very high pressure connection — several times the pressure exerted by many other brands of the split bolt type. The extra strength of Blackburn Connectors holds the high pressure connection indefinitely. That is why Blackburn Connectors are trouble-free on the lines. That is why Blackburn Connectors are always preferred by those who have used them. That is why Blackburn Connectors are No. 1 in their field today.

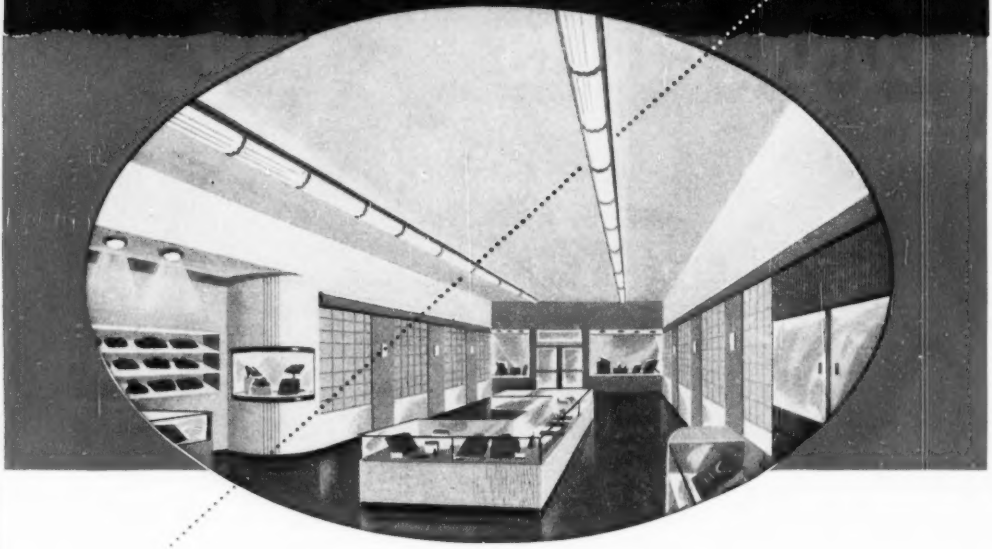
*Two samples of each size from 6 to 4/0 inclusive were tested for each brand including Blackburn. Each connector was assembled over two yokes which were put into the jaws of a standard tensile testing machine. Each connector was then pulled to destruction. The average breaking strength of Blackburn Connectors was 34.3% greater than the average of the 7 other leading brands representing over 90% of all the connectors produced.

JASPER BLACKBURN PRODUCTS CORP.

Builders of Quality Connectors for 15 Years • First, Madison & Clinton Sts., St. Louis 6, Mo.

Phone CE-3007

Here's why it pays to insist on *FLEUR-O-LIER* Fixtures for your lighting installation



You expect years of trouble-free, satisfactory performance from your lighting installation. And you should get it. Here are reasons why FLEUR-O-LIER fixtures assure you utmost satisfaction.

1 Wide Selection. 30 leading manufacturers make FLEUR-O-LIER fixtures. You choose from a range of styles, types and prices to get just what you need. And they're available from your local distributor.

2 Certification. FLEUR-O-LIER fixtures are made to rigid specifications that assure excellence of electrical and mechanical construction. Electrical Testing Laboratories, Inc., an independent authority, tests, checks and certifies that the fixtures conform to these specifications.

3 Complete Information. You, your electrical consultant or architect can know in advance the exact lighting performance any FLEUR-O-LIER fixture will give, for complete performance data is available on each fixture.

4 Certified Components. Every FLEUR-O-LIER fixture uses Certified Ballasts and Certified Starters, which are also tested to assure you best possible fluorescent operation.

Insist on FLEUR-O-LIER fixtures for your installation. Then you'll be assured of greatest lighting satisfaction and most operating economy.

Specifiers and buyers are now insisting, "Be sure the fixtures bear the Fleur-O-Lier label!"

FLEUR·O·LIER
Manufacturers

2116 Keith Building • Cleveland 15, Ohio

Fleur-O-Lier is not the name of an individual manufacturer, but of a group of fixtures made by leading manufacturers. Participation in the Fleur-O-Lier program is open to any manufacturer who complies with Fleur-O-Lier requirements.

Above — *Completed installation.*
Left—*Meter removed; by-pass clamps in place.*

- **APPLICATION**
  For use with any standard 4 or 5 terminal self-contained socket type meters — singlephase, 3 wire network; or 3-phase, 3-wire. May be used with separate demand or combination watthour and demand meters, thermal or mechanical.
- **WEATHERPROOF CASE**
  Galvannealed steel. Suitable for indoor or outdoor mounting. 2″ or 2½″ hub at top. 2″ and 2½″ knockouts at bottom.
- **NO SERVICE INTERRUPTIONS**
  By-pass clamps permit removal or testing of meter without interrupting load. See illustrations.
- **METER TESTING**
  Standard test jack may be used for testing meter in conventional manner.
- **LOW COST INSTALLATION**
  The H.D. device, list price $35.00, permits the use of self-contained meters on services to 200 ampere capacity.

Duncan Type H. D.
Heavy Duty Meter Mounting Device

THE TYPE H. D. Heavy Duty Meter Mounting Device provides a compact method of connecting conductors up to #0000 copper, or 250,000 CM aluminum, directly to the terminal blades of a socket-type meter with ease and safety. The H.D. Device requires a minimum of space for metering equipment in its current range. Overall height is 18″; width, 9″. The H.D. Device is particularly applicable on services above 100 amperes and up to 200 ampere capacity. For complete information send for Bulletin No. 164. DUNCAN ELECTRIC MFG. CO., Lafayette, Indiana.

...makers of meters for forty-one years

DUNCAN

LAFAYETTE **INDIANA**

CRESTOLOY LINEMEN'S SIDE-CUTTING PLIERS.
No. 1950, in 6, 7 and 8" sizes.
CRESTOLOY END CUTTING NIPPERS.
No. 72, in 6 & 7" sizes.
CRESTOLOY DIAGONAL CUTTING PLIERS.
No. 942, in 4, 5, 5 1/2 and 6" sizes.
CRESTOLOY LONG NOSE PLIERS.
No. 1033, in 6 & 7" sizes. Also No. 654, same except with side cutter.
CRESTOLOY HEAVY DIAGONAL CUTTING PLIERS.
No. 542, in 7" size only.
CRESTOLOY LONG FLAT NOSE, SIDE-CUTTING PLIERS.
No. 650, in 7" size only.

This Plier is made of CRESTOLOY STEEL and has tested 100% satisfactorily

CRESTOLOY PLIERS

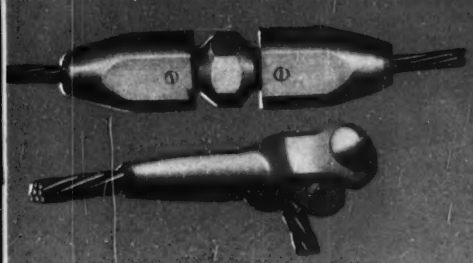
are individually tested!

Crestoloy Pliers take all the guesswork out of plier buying, because Crescent has taken all the guesswork out of plier making. Rigid specifications establish the material, design, workmanship, tests and inspection of these better tools. Strict adherence to these specifications is maintained by continuous tests and relentless inspection of the *individual* tools. Every plier carries the Crestoloy tag certifying that it has been individually tested.

Write for your copy of this little folder which illustrates 21 popular patterns of Crescent and Crestoloy Pliers.

"Crescent" is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK



L-M FARGO MESSENGER SPLICES AND DEAD ENDS

Both splice and dead end are available in choice of nut type, like the splice shown, for tightening on the ground, or in fully automatic, shown by the dead end, in which a slight cable tension sets the cones automatically. High strength bronze shell, cones, and lock screws. For Copperweld to 7/16".

OTHER L-M HARDWARE FOR AERIAL CABLE

L-M provides many useful items, such as the double upset extension bolt, which holds messenger clamps with adequate pole clearance; and the double suspension hanger, which supports messenger during stringing, and grips it permanently after bolts are tightened. Steel, with all parts hot dip galvanized.

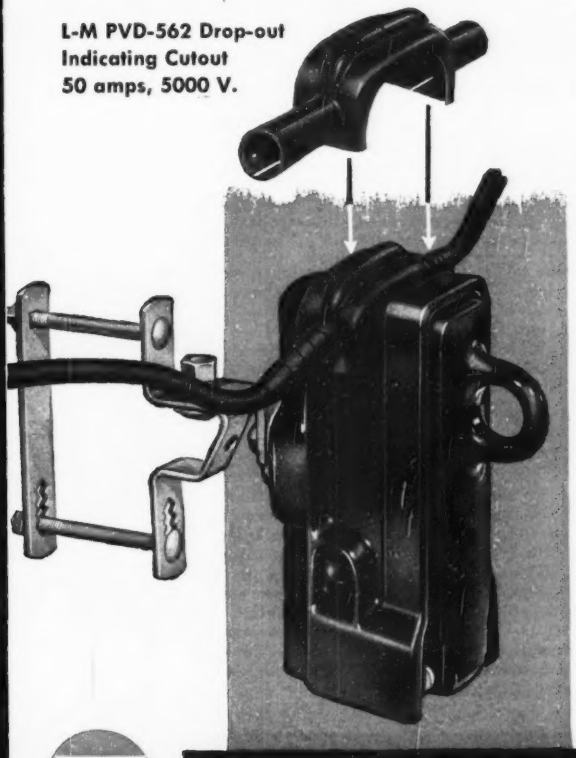
Free!

THIS HANDY GUIDE

Illustrates and describes types of cable, stringing methods, materials, typical installations; 32 pp, indexed. Ask the L-M Field Engineer or write Aerial Cable Materials Division, Line Material Co., Milwaukee 1, Wisconsin.

aerial cable... easy to use with L-M aerial cable materials

L-M PVD-562 Drop-out Indicating Cutout 50 amps, 5000 V.



No "Johnny-come-lately" is L-M in this aerial cable materials business. For years L-M men have worked right alongside of designers, erectors, and users, to test and develop materials that would help simplify the stringing of self-supporting aerial cable, and would help the user enjoy the maximum in service and long life.

In L-M's hardware department, the extensive line of aerial cable materials rates a special division. A few items are shown on this page; many more are described in the bulletin mentioned above. And of course many of L-M's regular hardware and specialty items find application in aerial cable installations.

Discuss your aerial cable problem with the L-M Field Engineer who may give you valuable suggestions; or write Aerial Cable Materials Division, Line Material Company, Milwaukee 1, Wisconsin.

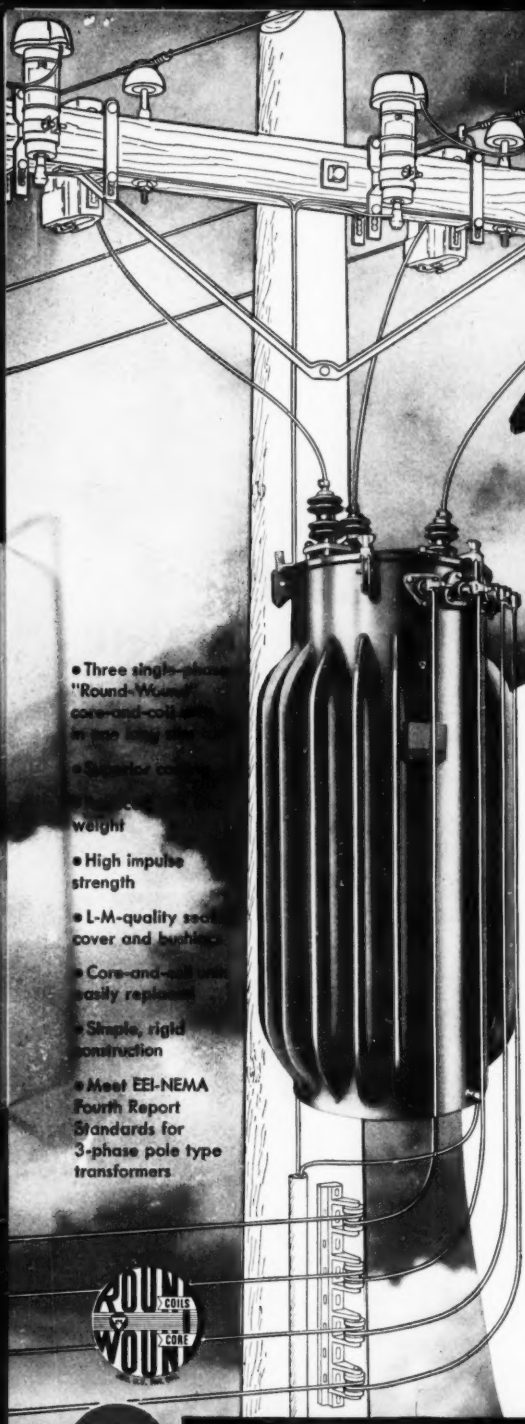
New! L-M aerial cable fuse cutout

The first drop-out cutout designed specially for aerial cable. Same indicating and operating features as the famous L-M PVD-56. But here the conductor runs right through a slot in the top.

You don't cut the cable. Just skin it and drop it into the slot. A copper-jawed clamp grips it firmly without deforming the conductor. The flexible synthetic hood waterproofs the top of the box and protects cut ends of the insulation. Ears of the hood are wrapped around the cable and taped. Makes a neat, fast installation.

LINE MATERIAL... Pole Line Hardware

Complete Coordinated Equipment for All Distribution Requirements 7125



L-M's 3-pha... "Round-W..." has a sing...

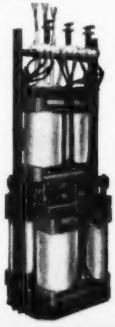
- Three single-phase "Round-Wound" core-and-coil units in one tank
- Superior cooling
- Low weight
- High impulse strength
- L-M-quality sealed cover and bushings
- Core-and-coil unit easily replaced
- Simple, rigid construction
- Meet EEI-NEMA Fourth Report Standards for 3-phase pole type transformers

Take a good look at the clean appearance of this pole-mounted three-phase L-M Round-Wound transformer. Makes a sweet-looking installation!

It's a sweet-working one, too. Famous L-M Round-Wound design gives all the "Balanced Performance" advantages of a wound core that isn't cut, unwound, or disturbed in any way after annealing, with the long round coils wound right onto the core . . . high short time overload capacity . . . better cooling . . . good regulation at all power factors . . . ample insulation . . . high impulse strength . . . mechanical strength.

New cold rolled silicon steels make possible reduced size and weight. We retain all the L-M "Balanced Performance" features. L-M-sealed covers and bushings. Slim vertical types, Round-Wound construction, in 9 to 150 kva. Also available in 225 to 500 kva in conventional horizontal construction. For details ask the L-M Field Engineer or **write Line Material Company, Transformer Division, Zanesville, Ohio.**

Note this sturdy construction!



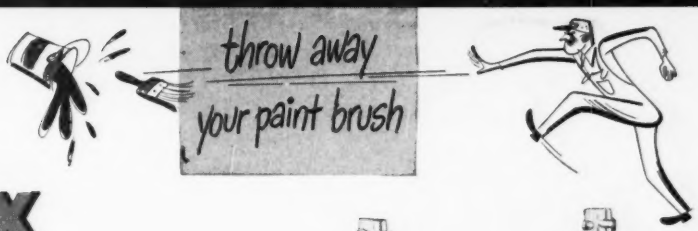
Three single phase Round-Wound core and coil assemblies, one above and two below, for best cooling and simplified mounting. These assemblies are rigidly held in a strong channel steel frame which dovetails into steel channels welded to inside of tank wall. Coil and tap changer leads are high insulation strength oil resistant cable, guided well away from structural members, assuring high impulse strength.

ROUND WOUND COILS CORE

LM

LINE MATERIAL Transformers

Complete Coordinated Equipment for All Distribution Requirements



ELEMEX Capacitors

in stainless steel tanks...

do a good job...good enough to do it!

ELEMEX capacitors produce more pay load on a distribution system by supplying kilovars economically at or near the load. They cut copper losses, raise voltage, and increase carrying capacity of feeders and other equipment.

ELEMEX capacitors do this job well . . . they are good enough to do it for a long time. Highest quality, low-density paper used in each pack . . . humidity-controlled rooms . . . individual control of evacuation and capillary impregnation with ELEMEX liquid . . . step-by-step testing of each individual unit throughout production. Those are some reasons for their outstanding 5-year service record.

Many Desirable Features

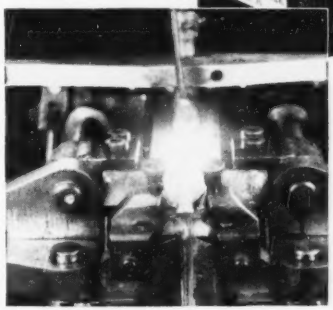
Stainless steel tanks . . . uniform terminal elevation above hangers for both 15 and 25 kvar sizes in each voltage class . . . L-M "Paragroove" connectors . . . L-M "Lifetime" solder-sealed bushings . . . sturdy, wood-reinforced shipping cartons.

Ask the L-M Field Engineer for the whole story; or write Capacitor Division, Line Material Company, Milwaukee 1, Wisconsin.

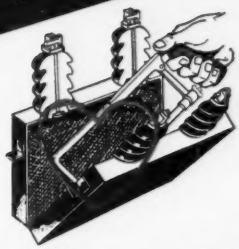
Corrosion-free Welding of Stainless Steel Tanks

ELEMEX capacitors come to you in stainless steel tanks, which never need painting. They save installation time because the lineman doesn't have to repair scratches or gouges caused by handling . . . doesn't have to scrape paint to get a good ground. And they *do* cut maintenance costs!

Tanks and covers are fabricated by the well-known Heliarc welding process. This method applied to stainless steel of very low carbon content assures a finished tank that is free of corrosion—*even at the welds.*



"Heliarc" welding of stainless steel tanks. Arc travels up one side, across, and down the other, I utt-welding the seam visible in the slot in the jig.



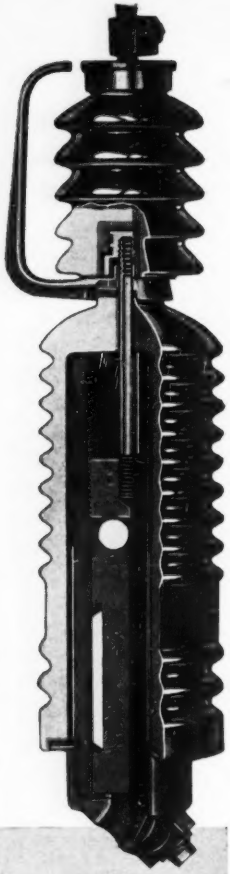
Low Unit Stress Assures Long Life

Conservative design, with lowest stress on packs and insulation. Heavy laminated major insulation, folded at the corners without slitting, assures uniformly high impulse strength.

7130

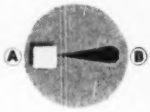
LINE MATERIAL . . . Capacitors

Complete Coordinated Equipment for All Distribution Requirements



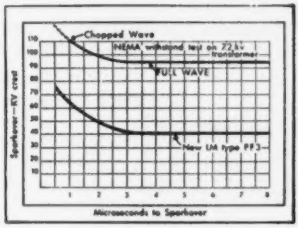
The arc that blows itself out

It's an old gag to a type PF arrester—but an arc will fall for it every time! The low sparkover distances at *A* trap the arc into a tight spot in the wedge-shaped fibre arcing chamber. The arc forms gas that blows it into a long arc at *B*—and blows it right out of the bottom vent with a bang! Works like a charm—without fail—in a half cycle or less! The arc doesn't stay at *A* long enough to burn the center electrode—so the arrester doesn't get hurt in the process. Better get the whole story—in this new **Bulletin LA3. Ask the L-M Field Engineer for a copy or write Line Material Co., Milwaukee 1, Wis.**



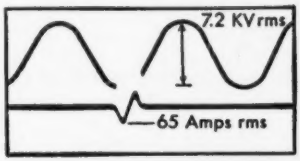
LM's new type PF3 Expulsion Arrester

Gives you lower impulse sparkover . . . greater transformer protection



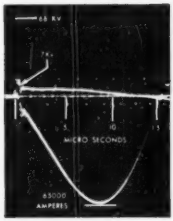
Curves at right show critical sparkover values of a 9 kv L-M PF3 arrester, compared with the minimum impulse strength of a 7200 volt transformer required by NEMA standards. Plenty of safety margin here!

PLUS
prompt interruption of follow current



Under extremely heavy lightning surges the expulsion action is so effective that the arc is blown out and follow current interrupted almost before it starts. Oscillogram shows 65 amp follow current drawn for .1 cycle with a 35000 ampere surge on a 7200 volt line with 1200 amps fault current capacity.

No limit on capacity . . . Long life



While the oscillogram shows only the NEMA-standard 65000 amp discharge test, obviously the PF3 is designed to meet this test with an ample margin of safety. ● There is no limit to the system capacity on which the PF3 may be used. ● The arc switching feature virtually prevents burning of the electrodes, assuring long life for the arrester with no appreciable increase in sparkover values.

Many Features You'll Appreciate

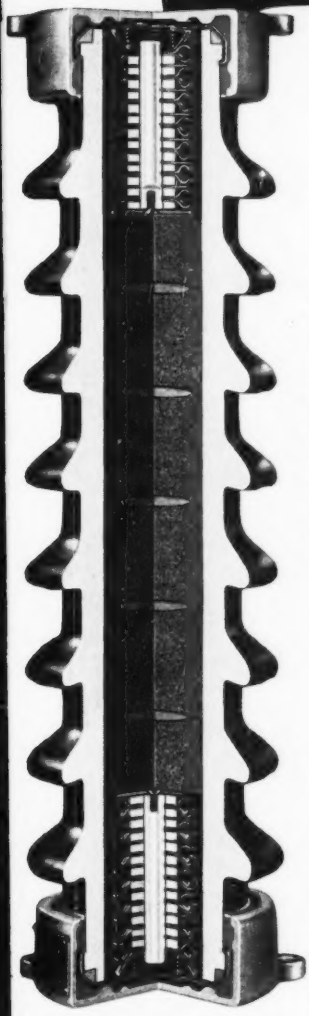
Heavy wet process porcelain housing with ample leakage distances... heavy external gap... Umbrella-type rain-shield is moisture-sealed above and below with heavy resin-coated gaskets... strong clamp-type terminals... Horn-fibre tube and fibre plug with wedge-shaped arc-switching chamber... choice of flat or cross-arm mounting hangers. In 3, 6, 9, 12, and 15 kv sizes.

LINE MATERIAL Lightning Arresters

Complete Coordinated Equipment for All Distribution Requirements

Here's Dependable, Economical Protection

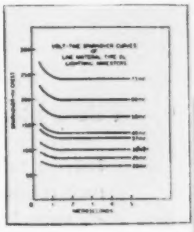
IN A 20 TO 73 KV "LINE TYPE" ARRESTER FOR SMALL AND MEDIUM-SIZE SUBSTATIONS . . .



L-M type DL Lightning Arrester

You don't have to invest a small fortune in equipment to protect small and medium-size power transformers. The type DL arrester gives you a safe margin of dependable protection. Its sparkover is low; it has ample discharge capacity to handle all kinds of lightning surges without damage; low IR drop but high resistance to follow current; extremely long life with unchanging characteristics; the arrester is almost completely free from outside influences; and the cost leaves your equipment budget feeling no pain.

Consistently Low Impulse Sparkover



As the front ends of the time-current curves show, the sparkover is consistently low, even under steep-front waves. Yet it's plenty high to prevent operation during switching surges.

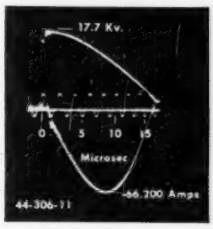
Heavy Duty Stabilized Spark Gap

Heavy alloy discs are separated by ceramic spacers with silvered surfaces which form a voltage divider of the capacitance type. The material used has a dielectric constant many times that of usual ceramic insulators, assuring a high degree of stability and freedom from outside influences.

It's a *heavy duty* gap—two ways. *Electrically*, because it has ample capacity to handle both heavy and long low surges without damage or change in the low sparkover. *Mechanically*, because we put half of the gap at each end of the arrester so there's very little chance of damage in shipping and handling.

Extremely High Discharge Capacity

Oscillogram shows NEMA standard 65,000 amp test of a 3 Kv section on a 5 x 10 ms surge. The DL has plenty of discharge capacity, because the L-M "Granulon" is molded right *into* the housing, filling it completely from wall to wall. Thus the element has greater diameter and correspondingly higher thermal capacity. Housing and gap are permanently sealed at top and bottom with heavy synthetic gaskets compressed under spun-on copper caps, plus heavy galvanized malleable caps cemented on to protect copper caps and seals and provide for connections and mounting.



Here's Complete Information

Details on design, construction, sizes, ratings, dimensions. Better get a copy of this new bulletin LA-4. Ask the L-M Field Engineer or write Line Material Co., Milwaukee 1, Wis.

Wide Variety of Mountings

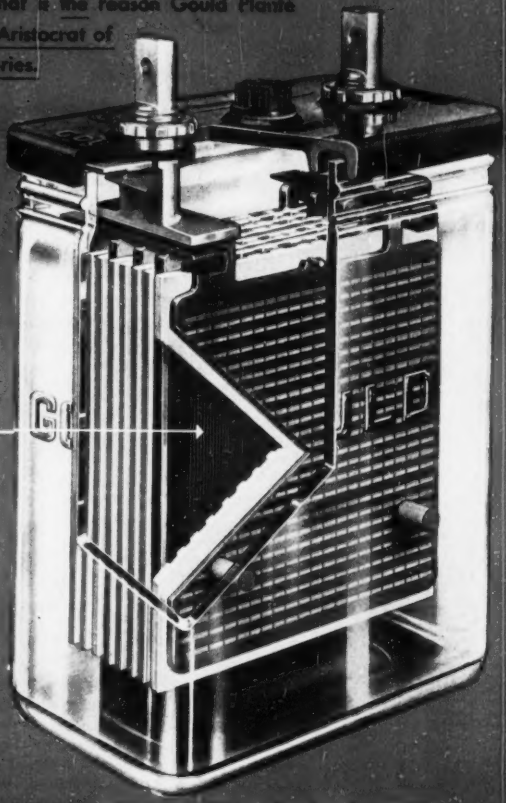
Five different brackets or hangers are available for convenience in hanging the arrester from substation structures or mounting on walls or single or double crossarms.

LINE MATERIAL Lightning Arresters

Complete Coordinated Equipment for All Distribution Requirements

HERE'S WHY YOU GET LONGER LIFE WITH GOULD PLANTÉ

Planté positive plates are pure lead. They contain no antimonial impurities to contaminate the negative plates. That is the reason Gould Planté is universally accepted as the Aristocrat of Stationary Batteries.



PURE LEAD MEANS SERVICE

Batteries on full float service require a small current to offset normal self-discharge. This self-discharge is due primarily to migration of antimonial impurities from the positive grids or grid frames to the negative plates. As the self-discharge rate increases, more and more antimony is transferred to the negative plates. The cycle is repeated with increasing tempo until the positive grid fails completely.

Gould Planté batteries contain no antimonial impurities. Their voltage requirements and capacity remain constant throughout their amazingly long, low-cost life.

GOULD'S COMPLETE LINE

Other Gould types—Planté, Kathanode and Dreadnought—are designed to meet the diverse capital expenditure, cost, service, and capacity requirements of switchgear, alarm system, emergency light and power, or telephone battery users.

The Gould "Battery Selector," GB-852, gives full information. Write for your copy, now.

GOULD

STORAGE BATTERY CORPORATION

TRENTON 7, NEW JERSEY

Always Use Gould Automobile and Truck Batteries

"SERVICE UNINTERRUPTED"

The client, a major power utility, gave Bechtel Corporation this instruction:

> ***Replace all controls and switchgear at 2 large mountain hydro-electric stations — WITHOUT INTERRUPTING POWER SERVICE.***

This required an intricate network of temporary facilities — permanent outdoor switchyards, one in a solid granite cliff under "hot" transmission lines — new wiring, switchboards and equipment — while providing every possible safeguard for the protection of workers.

The finished job was delivered on schedule with workmanship that won the client's praise — another example of the results obtained when engineering experience, special construction skills and competent direction are combined under single responsibility.

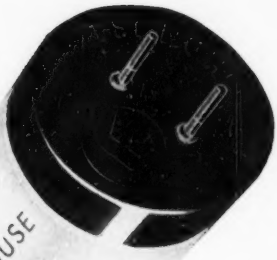
BECHTEL CORPORATION

SAN FRANCISCO
LOS ANGELES • NEW YORK

ECONOMIC STUDIES · PROCESS DESIGN · ENGINEERING · PURCHASING · CONSTRUCTION

Westinghouse

Fluorescent Lamps



NOW LAST 3 TIMES AS LONG!

...YET COST NO MORE!

SAVE 2/3

SAVE THIS– ONE LAMP NOW LASTS AS LONG AS 3.

LAMP COSTS

TIME SPENT REPLACING BURNED-OUT LAMPS

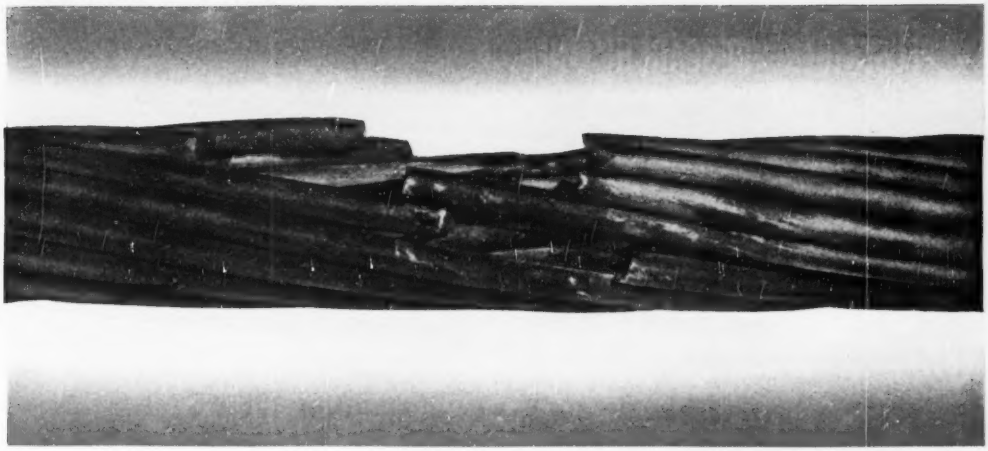
SAVE THIS– LAMPS NEED BE REPLACED ONLY ⅓ AS OFTEN.

Here's the biggest news in fluorescent lamps that's come along in years . . . NOW Westinghouse fluorescent lamps will last 2½ years in average store installations . . . 3 years in average one-shift office or factory installations.

Light output, too, has been improved—Westinghouse fluorescent lamps now burn brighter and longer than ever before. So, when you buy lamps, buy Westinghouse and save! Lamp Division, Westinghouse Electric Corp., Bloomfield, N. J.

YOU CAN BE SURE... IF IT'S

Westinghouse



How would you keep this conductor in operation?

There are many ways... but only one that assures the lowest-cost and most reliable job. It is the use of Preformed Armor Rods.

Multi-strand breaks repaired with Preformed Armor Rods *exceed* the strength and conductivity of the original conductor! And repairs are made at a *fraction* of the cost of cutting out and splicing . . . usually about 2% of any other conventional method.

Take the recent case of a large Mid-Western Public Utility*. Inspection revealed one to four strands broken on a 200 MCM, 7-wire, hard-drawn copper transmission line. Breaks occurred under clamps due to vibration and between towers due to lightning and flashovers.

Seventy-two inch lengths of hard-drawn bronze Preformed Armor Rods were applied to develop a tight-gripping cover over the breaks. *The average time for repairing a break was only three minutes!*

Whatever your problems of vibration damping, tapping, dead-ending, repairing or splicing . . . a simple system of Preformed Armor Rods will do the job better and cheaper than any other method.

Write Preformed Line Products Co., for complete details and a free sample of Preformed Armor Rods.

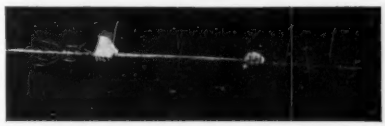
*name supplied on request

PREFORMED ARMOR RODS ARE FOR USE UNDER PATENT NO. 2,275,019—OTHER PATENTS PENDING.

EASY TO APPLY

The lineman takes from half to all rods needed for a complete installation and lays them across and around the conductor. The lay of the rods is in the same direction as the lay of the conductor.

He wraps these rods around the conductor several times. He uses a wiping action of the hands and a motion like wringing water from a cloth.



He continues the wiping action along the conductor.

The finished job.

PLP COMPANY

PREFORMED LINE PRODUCTS COMPANY
1051 POWER AVENUE • CLEVELAND 14, OHIO

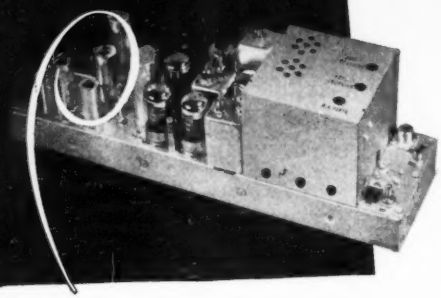
No. 3 of a Series

Motorola "RESEARCH" LINE...

SPECIALISTS in the field of mobile radio for 20 years now offer you . . .

INSTANTANEOUS I D C DEVIATION CONTROL for the **BEST IN 2-WAY RADIO**

A MUST IN ALL ADJACENT CHANNEL SYSTEMS



Now there's

INSTANTANEOUS I D C DEVIATION CONTROL

IN THE MOST MODERN, EFFICIENT AND EFFECTIVE COMMUNICATIONS EQUIPMENT YOU CAN OWN!

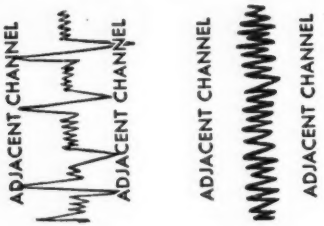
Even better than ever before! *Proved* by past performance —now *improved* through specialized experience. Customer reports are unanimous in acclaiming Motorola's superior performance, endurance and freedom from obsolescence: Proof that top quality costs *you* less in the long run.

I D C — A revolutionary, voice wave slope-limiter invented by Motorola Engineers to improve the utility of 2-way radio: eliminates channel "spillover"—protects communication's intelligibility—increases the voice dominance over noise and keeps radiated power within useful channel limits.

I D C — A symbol of Motorola's continued leadership. Instantaneous Deviation Control satisfies the FCC, July 1, 1950 modulation control regulation.

I D C — A pace setting development of the Motorola Research Laboratories, the world's largest laboratories devoted exclusively to the development of F.M. 2-way radio equipment.

INSTANTANEOUS CARRIER DEVIATION



WITHOUT I.D.C.

1. Unlawful overmodulation.
2. Interference with channel neighbors.
3. Loss of speech intelligibility on weak signals.
4. Decreased average percent modulation.

WITH I.D.C.

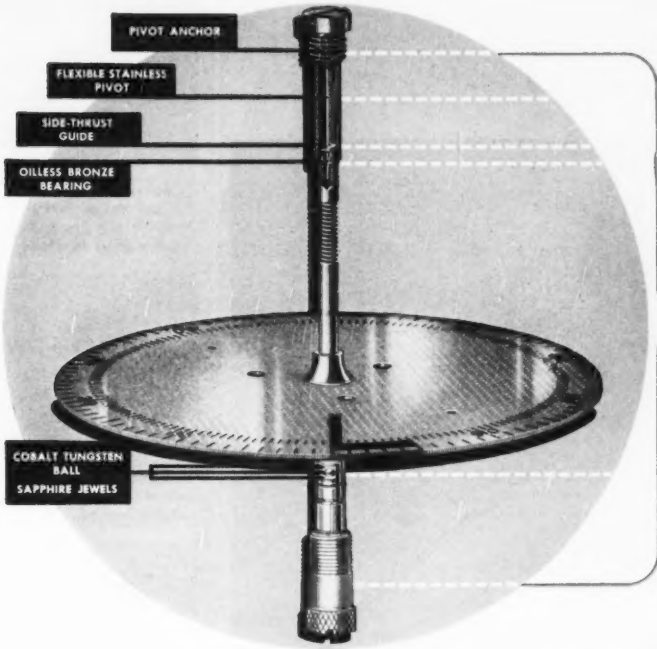
1. Instantaneous automatic limiting of modulation deviations.
2. Maximum protection of channel neighbors.
3. Preservation of speech intelligibility for signals both strong and weak.
4. Increased average percent modulation.

Compare Feature for Feature with any other equipment on the market. Get the complete story . . . . Write today.

MOTOROLA INC.
Communications & Electronics Division
4545 W. AUGUSTA BLVD. • CHICAGO 51, ILLINOIS

Motorola
"RESEARCH" LINE
F M 2-WAY RADIO

THE BEST COSTS LESS IN THE LONG RUN!



SERVICE PROVED BEARINGS

•

Oilless
Noiseless
Troublefree

Sangamo J Watthour Meters

Sangamo J Meters are equipped with a modern improved *oilless, noiseless, non-corrosive bearing system—proved* by 9 years of troublefree service. As shown in the diagram above, the lower bearing assembly consists of a non-ferrous cobalt tungsten ball and two sapphire jewels, while the oilless upper bearing is a flexible, stainless steel pivot of a length designed to avoid frequency vibration and the resultant noise.

Sustained Accuracy . . .

The accurate performance of this bearing system is proved by a large group of J Meters, tested after 9 years in actual customer service, which showed a variation averaging only five-hundredths of 1% in accuracy from that at the time of installation!

Troublefree Service . . .

The J Meter bearing system, non-corrosive and rustproof in all climates, has been proved troublefree by the performance records of millions of these meters in service since 1940.

Economy of Maintenance . . .

This truly modern bearing system requires no adjustment. Sangamo J Meters are built for quick and economical maintenance. All repairs are minor repairs with the Type J Meter.

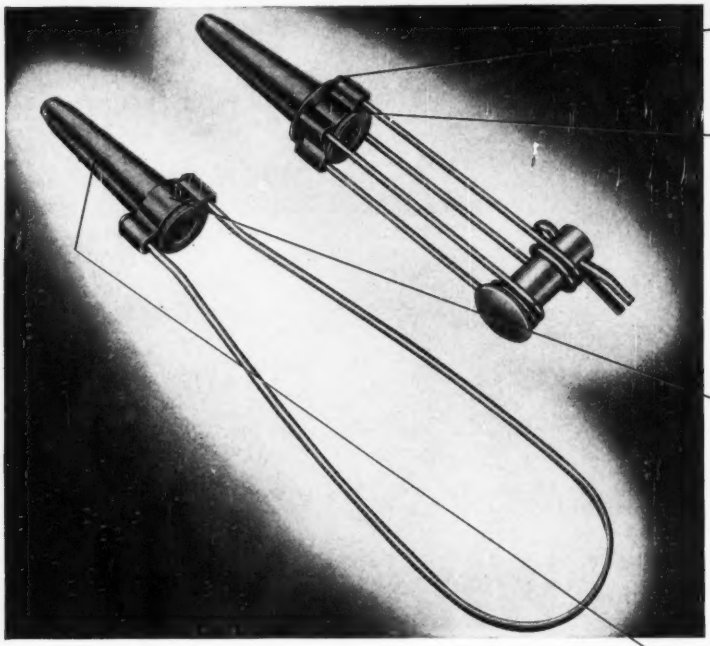
* * *

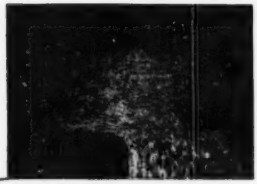
Sangamo J Meters have proved their ability to meet the requirements of today and the anticipated loads of the future with sustained accuracy, economy of maintenance and troublefree performance.

50TH ANNIVERSARY 1899 - 1949

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

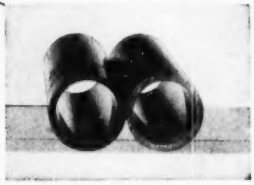
Accents on Accuracy



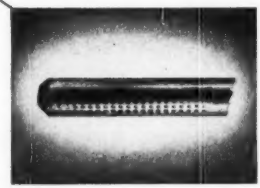


1. Full strength of bail is realized by tool design that flows steel smoothly into head, strengthening the grain structure.

2. Close control of bronze yoke insures sufficient bearing area against headed bail.



3. Tubing is not only held closely to size, but also to smooth inside finish, because folds or occlusions might hamper perfect performance.



4. Tapers of jaw and tube are accurately limited so wire is not pinched sharply where it enters jaws. This prevents fatigue breakage of wire.

in the manufacture of

STRAIGHTLINE DEADENDS

Here is a line of truly corrosion resisting deadends—products that will really last in any climate—at prices no higher than ordinary galvanized fittings. It takes accuracy of manufacture plus ingenuity and economy of design to use the best materials available regardless of cost and make a superior product at a competitive price.

The new type LDS, Long Deadends with the true Stainless bails for disc insulators, and FDS, Flexible Deadends with the true Stainless bails for spool and strain insulators are very light in weight. This reduces vibration fatigue tendencies. They are designed for easy installation and built with ample safety factor, which permits them to do the job both quickly and perfectly.

POWER-LINE CONNECTORS
AND
CONSTRUCTION SPECIALTIES

Reliable **ELECTRIC COMPANY**

3145 CARROLL AVENUE, CHICAGO 12, ILLINOIS

OVER 40 YEARS OF SERVICE TO THE UTILITIES

build more load with electric heat

Via the slidefilm, "Heat . . . Where You Want It," you can take your customers on a "seeing-is-believing tour" of dozens of plants where industrial electric heaters are doing a more efficient heating job in various applications on many kinds of machinery and equipment.

Then, to help them pin down the application of electric heat in their own jobs, there are five application bulletins—one on each of the major applications depicted below. In addition to the sound-slidefilm, each program kit contains 50 copies of each of these five application bulletins.

Available through your local G-E office, the complete kit (including slidefilm, record, and application bulletins) can be purchased for $15. If you haven't seen it, just clip the coupon to indicate when you'd like to have a showing. Or use it to order complete program kits for your own use.

HAVE YOU SEEN THESE OTHER MORE POWER TO AMERICA PROGRAMS?

Textile Mill Modernization
Electric Arc Welding
Oil Field Electrification
Industrial Power Distribution
Sewage Treatment
Resistance Welding
Materials Handling
Electric Transit

Sect. A684-12
Apparatus Department
General Electric Co.
Schenectady 5, N. Y.

( ) We'd like a showing of your MPA program on Industrial Electric Heaters

( ) Send us ____ program kits @ $15.00 each.

Name .....

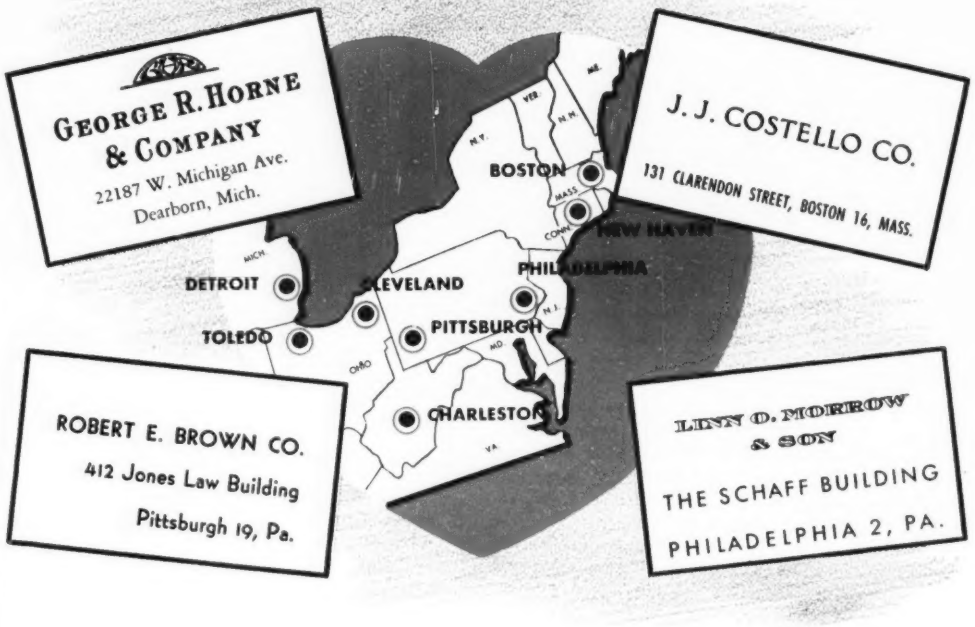
Company .....

Address .....

City ..... State .....

SALES "KNOW-HOW"

Today's most important ingredient . . .



Representing 120 years of combined experience selling electrical equipment

J. J. COSTELLO COMPANY

Thirty years of service to the electrical industry in New England representing outstanding manufacturers of electrical products. Sales offices in Boston, Mass., and New Haven, Conn., and adequate warehouse facilities in Boston, Mass. Salesmen cover the six New England States calling on Utilities, Consulting Engineers, Contractors, Industrial Organizations, Wholesalers and Government Agencies. Efficient office personnel and corrected mailing list for general or specific mailings.

LINN O. MORROW & SON

Operating as a Manufacturer's Agent in the Philadelphia Territory since 1919, covering the eastern part of Pennsylvania, southern part of New Jersey, Delaware, Maryland, Virginia and the District of Columbia. Now Handling Graphic Recording Instruments, Testing Instruments, Lifting and Separation Magnets, Explosion and Weatherproof Equipment. Prepared to sell electrical apparatus noncompetitive with the present accounts.

GEORGE R. HORNE & CO.

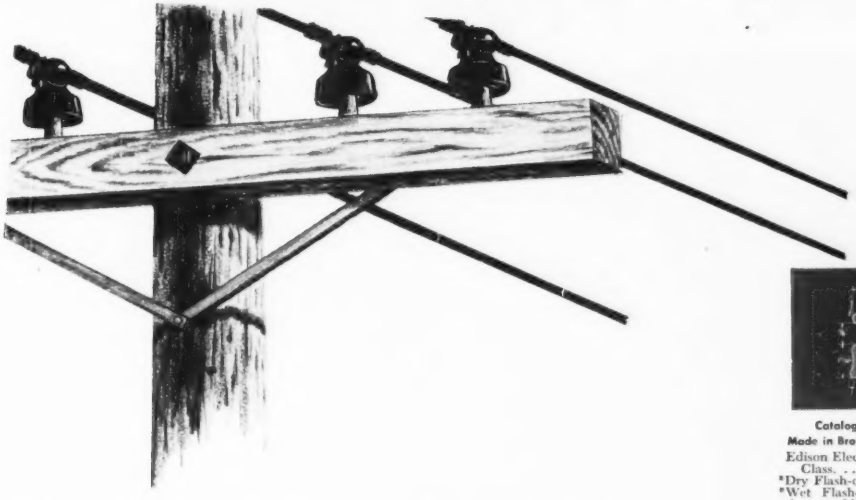
. . . . represents top flight manufacturers of electrical devices and apparatus. Salesmen cover all central and lower Michigan — representative in Toledo, Ohio, covers area including Toledo and Fort Wayne, Indiana. 30 years sales engineering experience selling consulting engineers, utilities, and industrial accounts. Complete mailing lists and facilities for direct mail advertising available.

ROBERT E. BROWN CO.

In business 22 years in the Tri-State District. Main Office in Pittsburgh; Branch Offices in Cleveland, Ohio and Charleston, West Virginia. Contacts continually being made with industrial plants, electric utilities, consulting engineers, electrical wholesalers and contractors. Mailing lists constantly revised and corrected, and arranged for general or specific mailings.

● *Covering the Heart of Electrical Industrial America*

WE SOLICIT YOUR INTEREST IN OUR ABILITY TO DO A SALES JOB FOR YOU

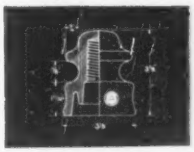


You can safely cut line costs with these new glass insulators

A safe way to combat the increasing costs of line construction is to use Armstrong's Glass Insulators. Mass produced on completely automatic machinery, they cost at least 40% less than hand-formed types. Yet quality controls insure that every Armstrong's Insulator meets or exceeds E.E.I., A.S.T.M., and A.S.A. specifications. Each pinhole cavity is hand-gauged for accuracy of diameter and thread contour. In addition, each production run is subjected to thermal shock tests far more severe than any that would be encountered in actual service.

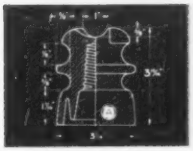
In addition, laboratory and field tests prove that abnormal loads will bend standard metal pins before Armstrong's Insulators will break or crush. This superior mechanical strength results in part from correct design: in part from the tough weather-resistant glass developed by Armstrong for these insulators. You can count on Armstrong's Glass Insulators for dependable, economical service under any line condition.

Call your distributor for sample and prices today. Or write Armstrong Cork Company, Industrial Division, Millville, New Jersey. Armstrong's Glass Insulators are available for export.



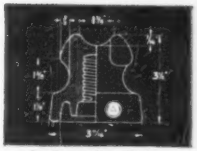
Catalogue No. 51-C1
Made in Brown and Clear Glass

Edison Electric Institute Class	1
*Dry Flash-over–Volts	43,300
*Wet Flash-over–Volts	23,500
Average Mechanical Strength, Lbs.	3,400



Catalogue No. 51-2U
Made in Brown and Clear Glass

Edison Electric Institute Class	2
*Dry 60 Cycle Flash-over–Volts	59,000
*Wet 60 Cycle Flash-over–Volts	23,000
Approx. Mechanical Strength, Lbs.	2,500



Catalogue No. 51-1A
Made in Brown and Clear Glass

Edison Electric Institute Class	1A
*Dry Flash-over–Volts	59,000
*Wet Flash-over–Volts	26,000
Average Mechanical Strength, Lbs.	2,500

*Test by Electrical Testing Lab, New York.

ARMSTRONG'S GLASS INSULATORS
do the job for 40% less

. . . PIONEERS IN

pd now present the

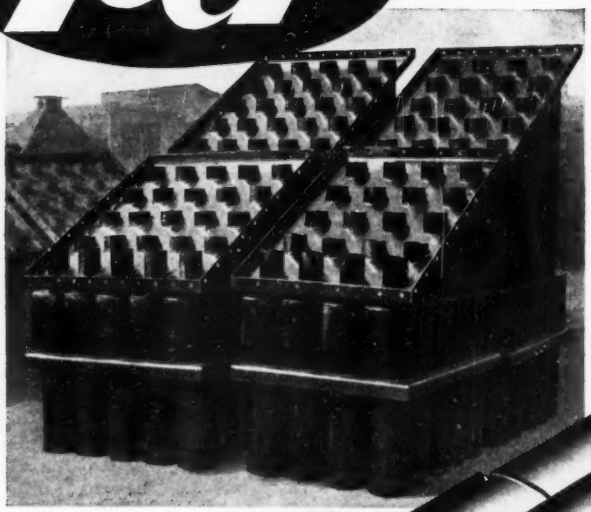


Fig. 3—VALMONT TYPE S Tubular Dust Collectors are made from standard, mass produced "building block" units of 25, 20 and 15 tubes each, sized for easy handling. All tubes are firmly welded in place at the factory, reducing the field erection costs by eliminating the need for field assembly of the tubes.

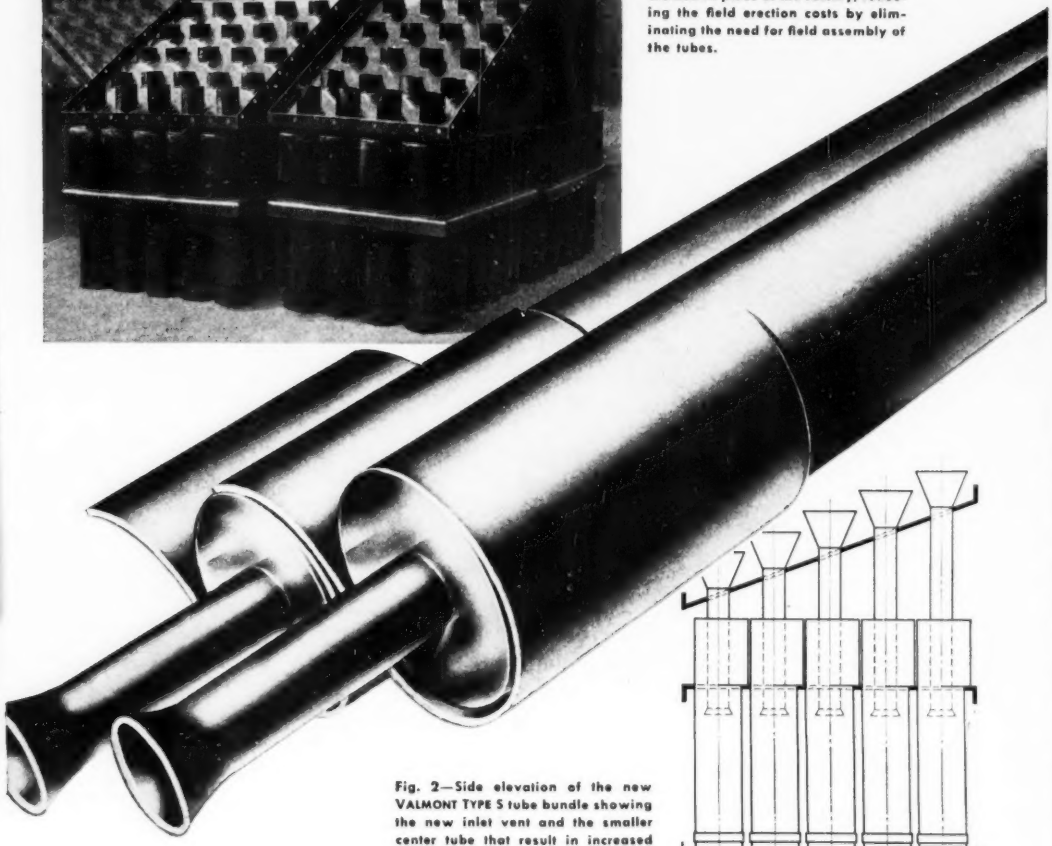


Fig. 2—Side elevation of the new VALMONT TYPE S tube bundle showing the new inlet vent and the smaller center tube that result in increased efficiency.

PRAT-DANIEL

DUST COLLECTION
VALMONT TYPE S

Fig. 1—The VALMONT TYPE S tube, heart of a new high in mechanical dust collection efficiency. Radical changes, inside and out, have placed this collector in a class by itself.

. . . UNEXCELLED BY ANY MECHANICAL DUST COLLECTOR

The VALMONT TYPE S Dust Collector is an entirely new design, based on an old principle. It employs the basic patented P-D feature of introducing the dust laden gas through a narrow, high inlet. This thin ribbon of gas reduces the distance of dust travel to the inner wall of the precipitating tube, thus increasing the ratio of collection on ultra-fine particles (in the critical range of from one to twenty microns).

The VALMONT TYPE S is new in many details of design that have been thoroughly tested and proven higher in efficiency . . . smaller in space requirements . . . lower in weight and cost. Such as the aerodynamic S shape of the gas inlet—the changes in proportion of width to height of inlet—the reduction in the size of the center gas outlet tube equipped with a flare.

In addition, to increasing efficiency, these design changes permit a much closer nesting of the tubes. Cost, weight and space are reduced accordingly—and the reduction in cubical requirements is particularly desirable when the collector is installed on existing equipment.

The VALMONT TYPE S is mass produced in building block units of 25, 20 and 15 tubes each, with all tubes welded in position at the factory. Field handling and erection costs are thus reduced and maximum efficiency assured.

Our project engineers, The Thermix Corporation, will be glad to plan the new VALMONT TYPE S into your new plant, or show you how easily it will fit into your existing layout. For additional information on this new advance in dust collecting write for Catalog No. 250S.

Project and Sales Engineers

(Offices in 28 principal cities)

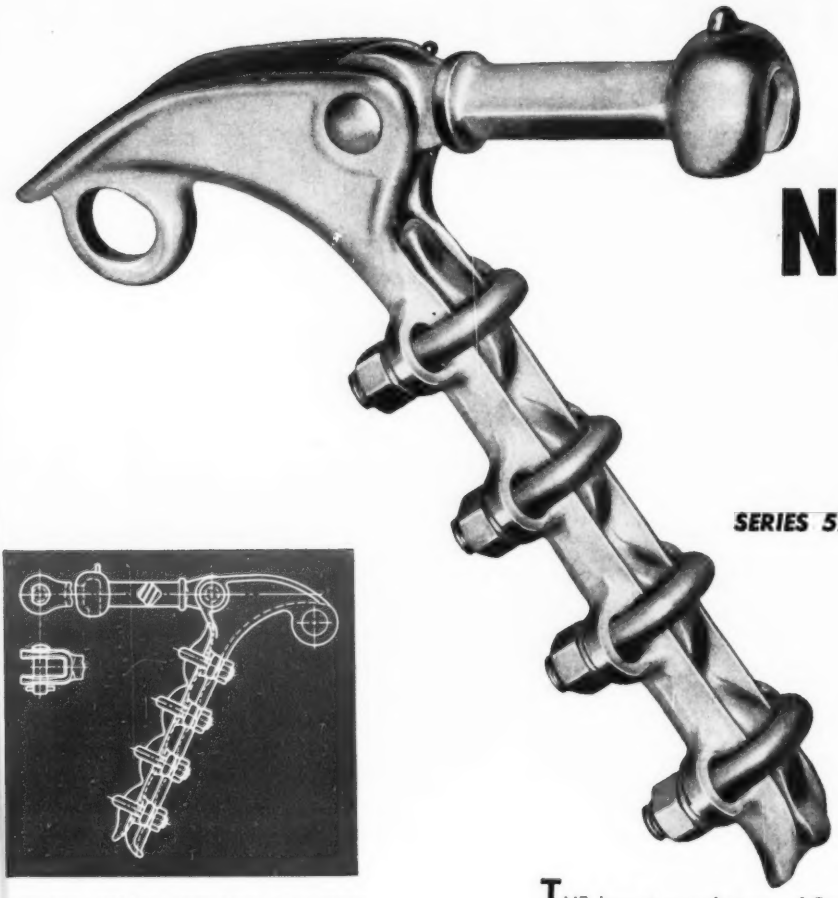
THE THERMIX CORPORATION

FIRST NATIONAL BANK BLDG. **GREENWICH, CONN.**

Canadian Representative: **T. C. CHOWN, LTD.**, 1440 Saint Catherine St., W., Montreal 25, Quebec

CORPORATION

EAST PORT CHESTER, CONN.



NEW BY

SERIES 5200

SERIES 5200 STRAIN CLAMPS

CATALOG NUMBER	MAX. CABLE DIA.	FITTING	ULTIMATE STRENGTH
5200 5210	.55"	Socket Clevis	10,000
5201 5211	.68"	Socket Clevis	15,000
5202 5212	.84"	Socket Clevis	20,000
5203 5213	.96"	Socket Clevis	30,000
5204 5214	1.10"	Socket Clevis	30,000
5205 5215	1.28"	Socket Clevis	35,000

Send For New Catalog

BTC's new catalog of Drop-Forged Hi-Line Hardware will soon be coming off the press. It's chuckful of information you'll want to have on hand—pictures, blueprints and complete specifications on Brewer-Titchener's entire line of Drop Forged Steel, Aluminum and Bronze Hi-Line Hard-Ware. Write today.

THE largest manufacturer of Drop-Forged Steel Transmission Line Conductor Clamps and Fittings, after a thorough investigation of materials, development of production techniques, and installation of new, modern, and efficient manufacturing facilities, now offers a complete new line of Minimum-Power-Loss (M.P.L.) Suspension and Strain Clamps for use on A.C.S.R. and all-aluminum conductors.

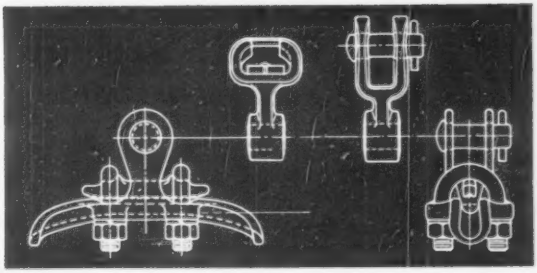
On high-current transmission lines, the use of magnetic ferrous clamps, completely enclosing the conductor, causes considerable hysteresis and eddy current power losses. The conductor heating and annealing effects of such clamps has been the current-limiting factor on some transmission systems.

In the clamps listed here, the magnetic path around the conductor is effectively broken by the use of non-magetic clamp bodies, and power losses, even on heavily loaded lines are negligible—the temperature of the conductor in the clamped section may well be lower than that in the span, due to the greater radiation surface of the clamp assembly.

The general design closely follows that of the time-tested B.T.C. Drop-Forged Steel Clamps, retaining all of their desirable features—Reduction of the effects of conductor vibration by light weight, short connecting length, and smooth die-forged clamp seats with

DROP-FORGED ALUMINUM M-P-L * CLAMPS

BTC



* *Minimum-Power-Loss*

SERIES 9500

ample cable-supporting length and large snubbing radii —Bell-mouthed corona-free large-radius beaded ends.

A wide range of sizes makes possible the selection of exactly the right clamp to fit properly the conductor.

The Suspension and Strain Clamp bodies are Drop-Forged from high strength Aluminum Alloy and are heat-treated, with all of the desirable physical properties of parts produced by these processes—superior strength and resistance to shock and fatigue without excessive mass and weight—uniformity and refinement of internal structure—lasting reliability in service —close dimensional fidelity—excellent finish and appearance.

Clamping Keepers and fully machined Connectors are Drop-Forged Steel.

Connecting Pins, Clamping Bolts, Nuts and Lock Washers are steel.

All ferrous parts are hot-dip galvanized.

Rated ultimate strengths are more than adequate for use on conductor sizes accommodated.

Further information on request.

Sold through your insulator manufacturer only.

SERIES 9500 SUSPENSION CLAMPS

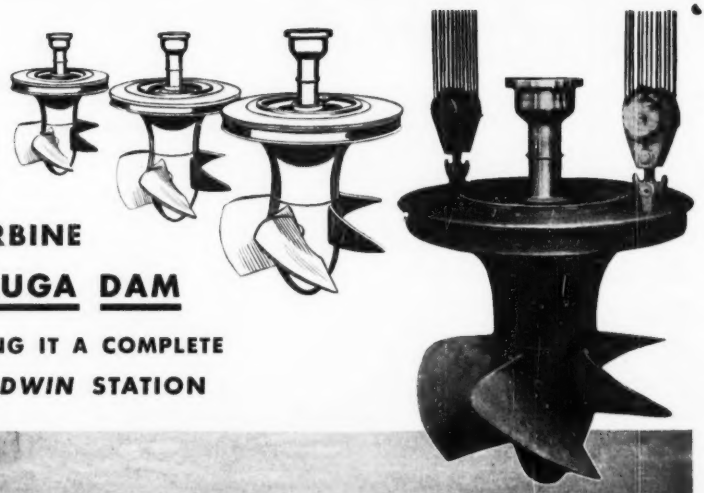
CATALOG NUMBER	MAX. CABLE DIA.	FITTING	ULTIMATE STRENGTH
9503 9533 9543	.83"	Socket Clevis None	18,000
9504 9534 9544	1.00"	Socket Clevis None	22,000
9505 9535 9545	1.15"	Socket Clevis None	22,000
9555 9565 9575	1.27"	Socket Clevis None	25,000
9506 9536 9546	1.375"	Socket Clevis None	25,000
9557 9567 9577	1.45"	Socket Clevis None	25,000
9507 9537 9547	1.60"	Socket Clevis None	25,000
9508 9538 9548	1.80"	Socket Clevis None	25,000
9509 9539 9549	2.00"	Socket Clevis None	25,000
9510 9580 9590	2.25"	Socket Clevis None	25,000

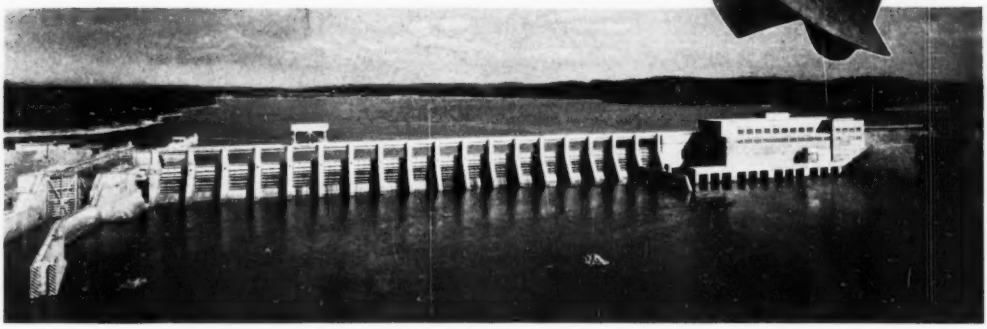
THE BREWER-TITCHENER CORPORATION, CORTLAND, NEW YORK

COMING....

THE FOURTH TURBINE FOR CHICKAMAUGA DAM

MAKING IT A COMPLETE *BALDWIN* STATION





A 33⅓% increase in capacity will be effected at Chickamauga Dam next year, when a new Baldwin turbine, now on order, is installed. This will complete the installation contemplated in the original design; the first three Baldwin turbines having been installed in 1937.

The new turbine is the adjustable-blade type, and will deliver 42,000 hp. at 75 rpm. under a normal head of 48 feet. It is designed to develop at least 20,000 hp. under a 25-foot head, and 36,000 hp. with a 36-foot head. This maximum utilization of reduced heads is of course possible because of the automatic positioning of the blades to suit each condition. Runner diameter is 22 feet, and total assembled weight is approximately 800 tons. When operating at full load, the turbine will discharge up to 8,750 cubic feet of water per second.

A total of twenty-seven Baldwin turbines have been built, or are on order, for various TVA projects. Types include Francis, fixed-blade propeller, and adjustable blade propeller types, in capacities from 30,000 to 53,000 hp. Baldwin's broad experience is available to you, in working out details on any development you have in prospect.

BLW THE BALDWIN GROUP **BALDWIN**

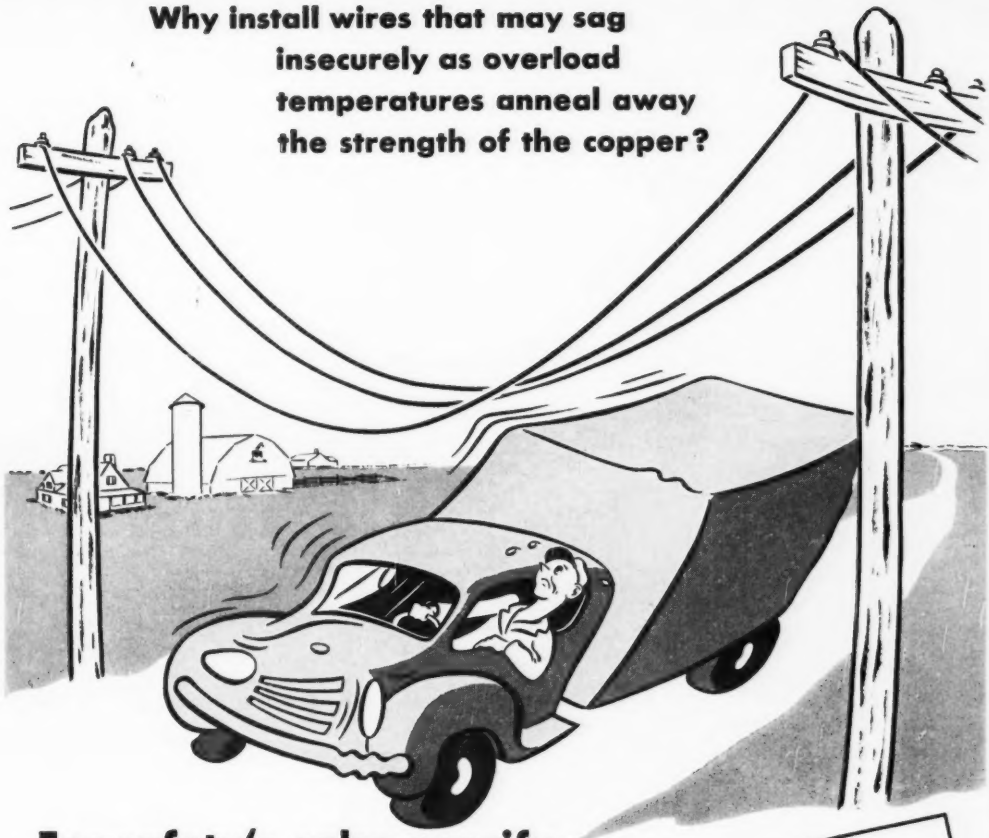
HYDRAULIC TURBINES

THE BALDWIN LOCOMOTIVE WORKS
Philadelphia 42, Pa.

THE PELTON WATER WHEEL COMPANY
2929 Nineteenth Street, San Francisco 10, Calif.

The Baldwin Locomotive Works, Philadelphia 42, Pa., U. S. A. Offices: Boston, New York, Philadelphia, Houston, St. Louis, Chicago, Cleveland, Pittsburgh, San Francisco, Seattle, Washington. In Canada: Baldwin Locomotive Works of Canada, Ltd., Toronto, Ontario.

Why install wires that may sag insecurely as overload temperatures anneal away the strength of the copper?



For safety's sake specify

Permanently strong! Hard drawn TENSILOK Copper changes virtually not at all, under temperature conditions that soon anneal commercial copper. Yet in purity, conductivity and tensile strength it rates above ASTM standards for ordinary electrolytic copper. You can count on it to retain 95% of Initial Tensile Strength after

- **600 years at 75° C.**

or
- **100,000 hours at 100°C.**

or
- **4,000 hours at 125° C.**

or
- **250 hours at 150° C.**

TENSILOK Copper WEATHERPROOF WIRES

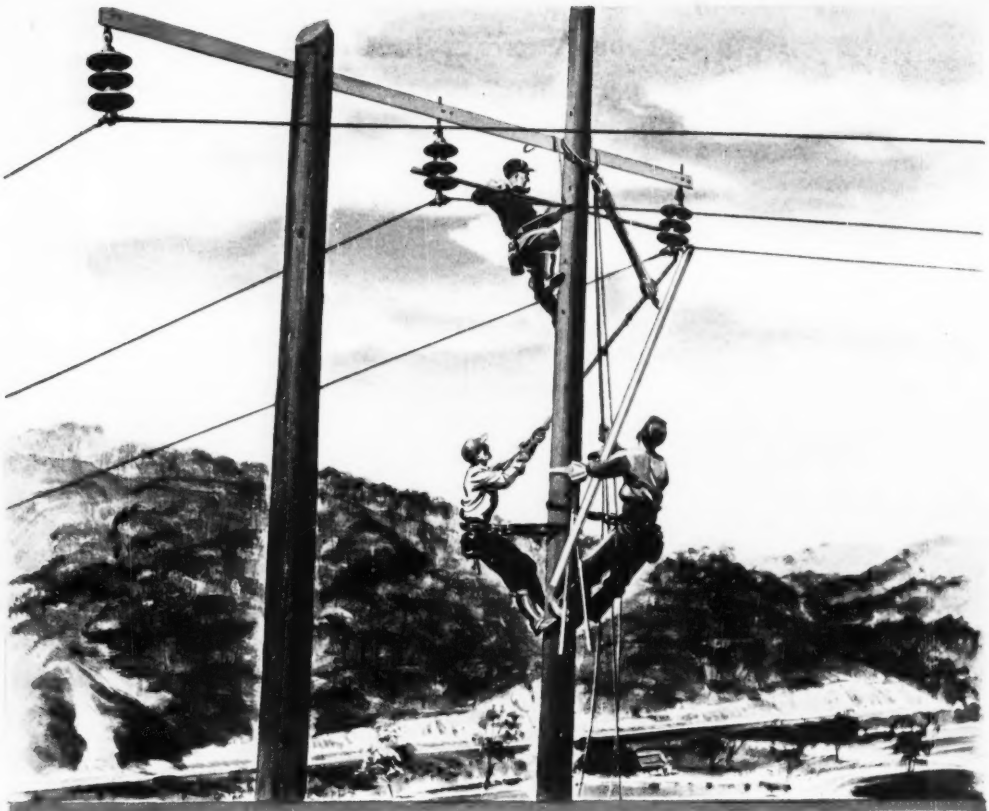
. . . it costs no more!

FREE! Complete-fact folder on Tensilok Weatherproof, with never-before-published Performance Curves. Write today to General Cable Corp., 420 Lexington Ave., New York 17, N. Y.

"More Power to You"

GENERAL CABLE
CORPORATION
Sales Offices in Principal Cities

MANUFACTURERS OF BARE AND INSULATED WIRES AND CABLES FOR EVERY PURPOSE



Are You Interested in MAINTENANCE ECONOMY?

If yours is the problem of increasing service yet decreasing costs, now is the time to use Hoosier service. For 30 years, Hoosier engineers, trained men and special equipment have served utilities with every type of transmission line construction and maintenance. The efficiency of such an organization naturally results in operating economy. Whether Hoosier works alone or supplements your own organization, you can be assured of new-construction skill and efficiency on every maintenance job. Call Hoosier today.

From actual photograph of Hoosier crew at work in Kentucky.

HOOSIER ENGINEERING CO.

ERECTION AND MAINTENANCE OF TRANSMISSION LINES

NEW YORK • **1384 HOLLY AVE., COLUMBUS, OHIO** • CHICAGO

HERE'S HOW
POSITIVE PROTECTION
IS DESIGNED AND BUILT INTO THE JOSLYN ARRESTER

1 OPEN ISOLATING GAP—Rigidly spaced to support line voltage *by itself*—In horizontal position to avoid fusing-over—Permits visual inspection from ground—No troublesome, hermetically sealed gap chamber.

2 SHORT INITIATING GAP—Low impulse sparkover characteristic—Less than 50% of standard Basic Insulation Levels, a *field-proved* protective margin for new and old equipment—No resistor in series with discharge path—No critical IR drop—Protected circuit is subjected only to *arc voltage* which is less than 60 cycle voltage rating of the arrester, even during *100,000 ampere discharge*.

2A RESTRICTED REGION around initiating gap develops high pressure during discharge.

3 LONG ARC INTERRUPTING GAP—Exclusive patented arc elongation action—Arc is blown by high pressure from confined initiating gap to larger, longer arc extinguishing chamber—Arc is automatically elongated three times the initial path—This elongation and cooling of arc takes place so rapidly that follow current is suppressed and extinguished in ½ cycle or less.

Rapid movement of arc over cool fibre deionizes arc gases and eliminates erosion of critical electrode and fibre areas—An exclusive JOSLYN ARRESTER feature which prevents change in its impulse sparkover characteristic even after long service under severe system fault current conditions—Thus Positive Protection is maintained through out the life of the Arrester.

3A ARC CHAMBER at lower pressure draws arc away from initiating region, causing cooling and elongation to 3 times initiating gap—Action is so effective in suppressing and interrupting follow current that Joslyn Arresters are *unlimited* with respect to 60 cycle current rating.

Even under direct strokes of lightning, these exclusive features built into the rugged, service-proved Joslyn arrester give you

POSITIVE PROTECTION

Branch offices in principal cities

•

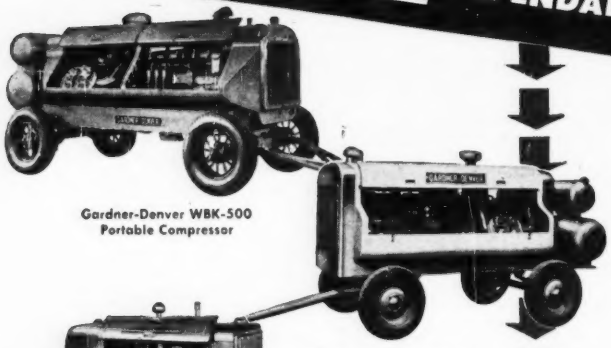
THE JOSLYN CO.
THE SOUTH EAST-JOSLYN CO.
SOUTHERN JOSLYN CO.
JOSLYN SOUTHWEST CO.
JOSLYN PACIFIC CO.

JOSLYN MFG. AND SUPPLY CO.

Complete Pole Line Equipment

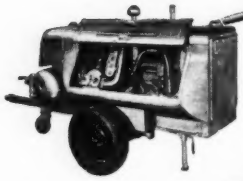
20 NORTH WACKER DRIVE, CHICAGO 6, ILL.

AN ALWAYS DEPENDABLE AIR SUPPLY . . .



Gardner-Denver WBK-500 Portable Compressor

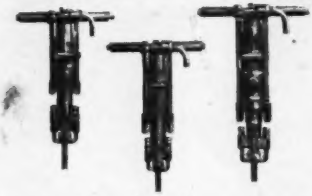
Gardner-Denver WHF-210 Portable Compressor



Gardner-Denver WHD-105 Portable Compressor

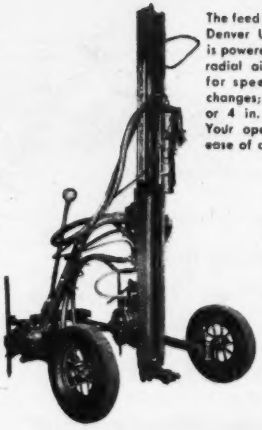
No matter where you send a Gardner-Denver Portable Compressor, you can be sure of a steady, uninterrupted air supply. For regardless of climate or altitude, the complete water jacketing of all cylinders "weather-conditions" them against over-heating — and from cold, unlubricated starts in sub-zero weather. For complete information, write Gardner-Denver Company.

. . . FOR THE RIGHT AIR TOOLS



There's a Gardner-Denver Sinker that's "correct" in size and power for every type of ground. Shown here are the three most popular models: the high-speed S45 for secondary drilling or medium rock—the S55, most popular 55-pound sinker on the market—the S73, 67 pounds of speed and power for deep holes or the hardest formations.

Powerful Gardner-Denver B87 Paving Breaker has exclusive throttle safety latch — can be easily moved around the job without shutting off the air. Easily converted to a sheeting driver.



The feed of the new Gardner-Denver URM99 Wagon Drill is powered by a five-cylinder radial air motor. Designed for speedy, six-foot steel changes; carries a 3½ in. or 4 in. bore derrick drill. Your operator will like the ease of control.

The Gardner-Denver T23 Backfill Tamper is balanced for easy "walking" over the fill — has valve and exhaust that won't "freeze" in cold, damp weather — contains integral oil reservoir that assures complete lubrication.

Gardner-Denver Model 28 Clay Digger makes digging easy in clay or hardpan—can also be equipped with axe blade for trimming or cutting timber, or with mail point or chisel for light demolition work.

GARDNER-DENVER SINCE 1859

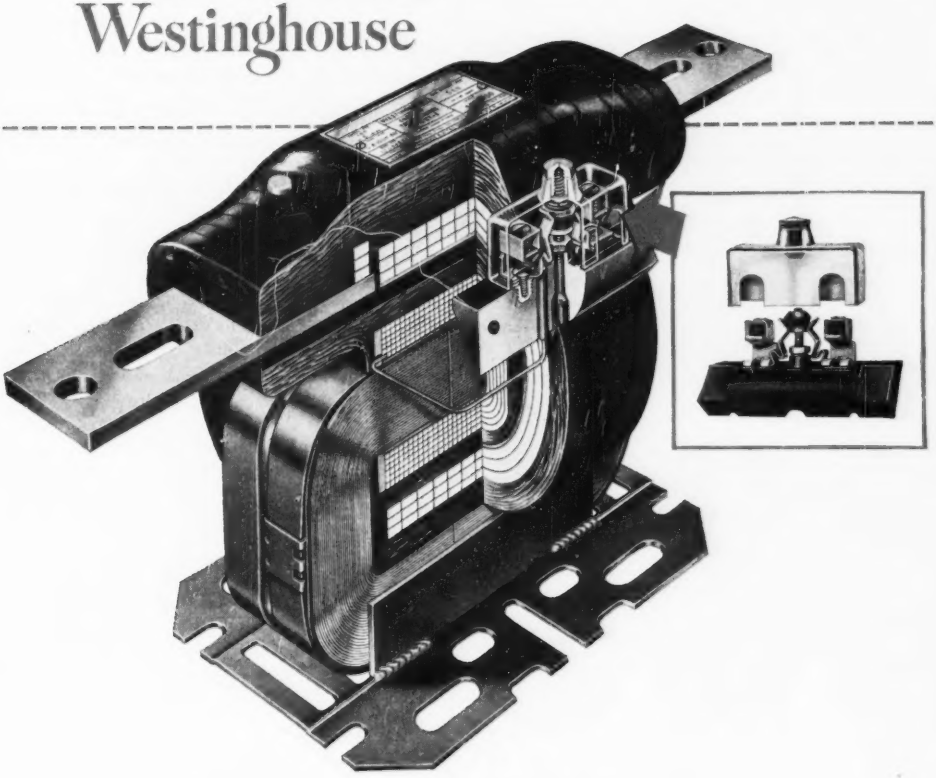
GARDNER-DENVER COMPANY

QUINCY, ILLINOIS

IN CANADA: GARDNER-DENVER COMPANY (CANADA) LTD., TORONTO, ONTARIO

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



AUTOMATIC PROTECTION

. . . For "CT" Secondaries

It's safer! It's a Westinghouse exclusive! The automatic safety device on Westinghouse "CT" Instrument Transformers protects workmen from high-induced, secondary voltages that may result when loads are disconnected.

The secondary terminals (covered with a sealable transparent shield that permits visual inspection with the seal intact) are provided with special spring contacts, held apart by a tapered insulating slider with a brass ring at its base. When the seal is broken and the protective shield removed, tension automatically forces the slider up, short-circuiting the terminals. The slider may be readjusted safely by hand, or it may be set for permanent open or permanent short circuit.

Other features of Westinghouse "CT" Transformers include silver-plated primaries, Hipersil® cores, and one-piece bases that simplify mounting on either flat surfaces or on pipe frame supports.

Compact, accurate, dependable, Westinghouse "CT" Transformers are available in the same proved design throughout the entire range of ratings—2.5, 5, 8.7, 15L, 15H and 25kv. For further information on the *most complete line of instrument transformers* in the industry, contact your Westinghouse representative, or write for Booklet B-4319. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70544

Westinghouse

INSTRUMENT TRANSFORMERS

Wagner Distribution Transformers

are *Standardized*

to meet your requirements

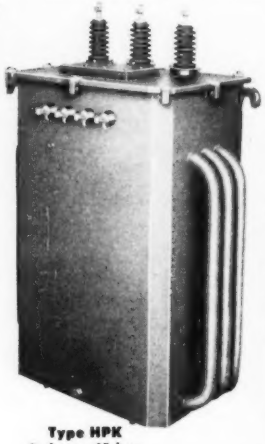
Type HEK
Single-phase
3 kva.

Wagner's complete line of distribution transformers includes every rating and design listed in the E. E. I.-NEMA Fourth Report! This means that you get the benefit of the improved design, quality construction and high efficiency of Wagner Transformers with *standardized* mechanical features in ratings of 500 kva and below—15,000 volts and below.

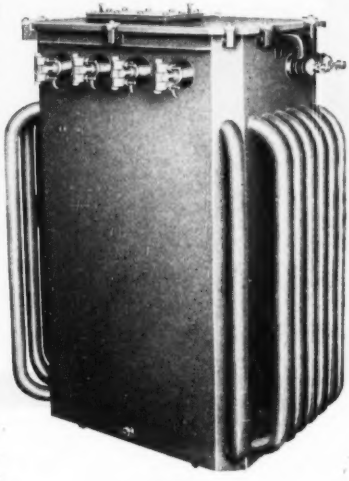
You save time, money and worry when you make your selection from Wagner's widely diversified line of distribution transformers — no matter what your particular requirements may be . . . there's one to fit your needs.

Type HEX
Single-phase
25 kva.

Type HEB
Single-phase
75 kva.



Type HPK
3 phase—45 kva.



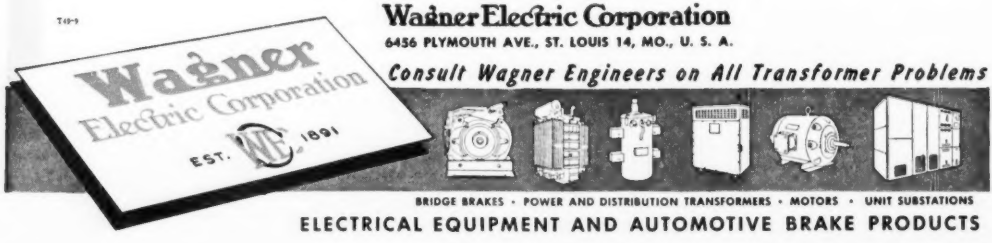
Type HPB
3 phase—112½ kva.

Wagner has a nationwide organization to provide fast, convenient service, with 29 branches located in principal cities ready to help you with your transformer problems. Bulletins TU-180 and TU-181 give complete information on Wagner Transformers.

T49-9

Wagner Electric Corporation
6456 PLYMOUTH AVE., ST. LOUIS 14, MO., U. S. A.

Consult Wagner Engineers on All Transformer Problems



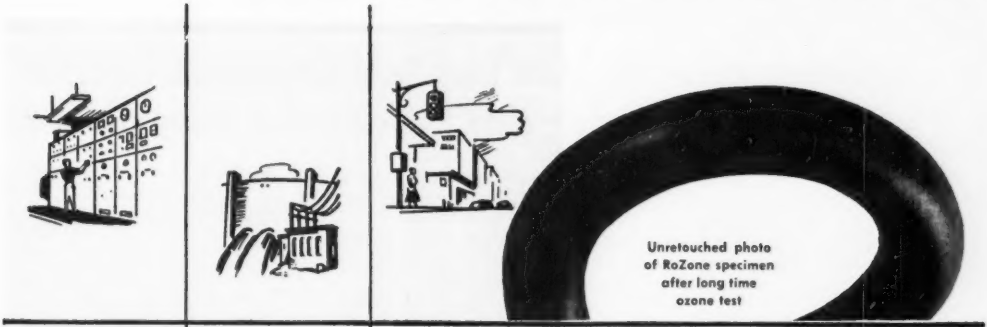
BRIDGE BRAKES • POWER AND DISTRIBUTION TRANSFORMERS • MOTORS • UNIT SUBSTATIONS

ELECTRICAL EQUIPMENT AND AUTOMOTIVE BRAKE PRODUCTS

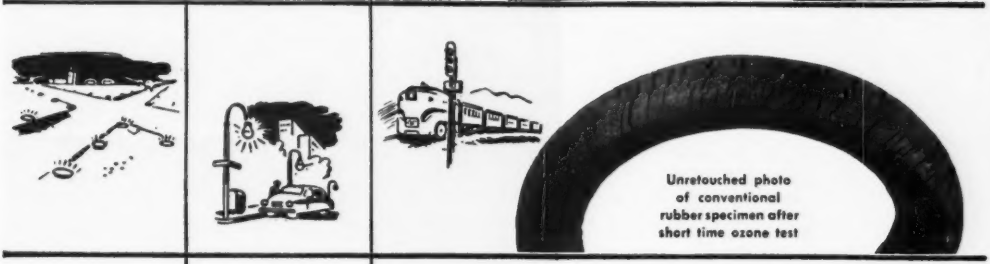
Rome RoZone

THE SUPERIOR OZONE-RESISTANT INSULATION

adds years to cable life...



Unretouched photo of RoZone specimen after long time ozone test



Unretouched photo of conventional rubber specimen after short time ozone test

ROZONE INSULATION POSSESSES

- High dielectric and impulse strength
- Excellent resistance to corona and ozone cutting
- Remarkable electrical stability in water
- Inherent resistance to aging, heat and sunlight

The photos above tell their own story. At the top is RoZone insulation after being subjected to an ozone atmosphere for a period well in excess of specification requirements. Note that there is no deterioration of compound... no surface checking. Below is conventional rubber insulation after a much shorter ozone test. These unretouched photos demonstrate clearly the superiority of RoZone under conditions of ozone cutting when higher voltages are involved... all of which means longer service life and greater dependability.

Specifying RoZone pays off on many installations. For example, high voltage power circuits... station or supervisory control signal cables... street lighting cables... airport lighting and control cables as well as general purpose wiring where high quality and long life is paramount.

Write for specification RO-4 today and see why leading utilities, industrials and railroads are specifying RoZone.

It Costs Less to Buy the Best...
Buy Rome RoZone

ROME CABLE
Corporation
ROME · NEW YORK
From Bar to Finished Wire

ROME CABLE ROME, N.Y.

Allis-Chalmers Builds for Electric Utility Progress

AUXILIARIES that

Continuity of Operation — Low Long Term Maintenance Important in Cost Picture — *Here's What A-C is Doing About It!*

THE POWER PINCH has been licked, but the cost pinch is still here. To cite one example, the cost of fuel alone is approximately *double* what it was in 1940.

The job now is to cut costs. Trimming auxiliary operating costs can improve the overall power cost picture.

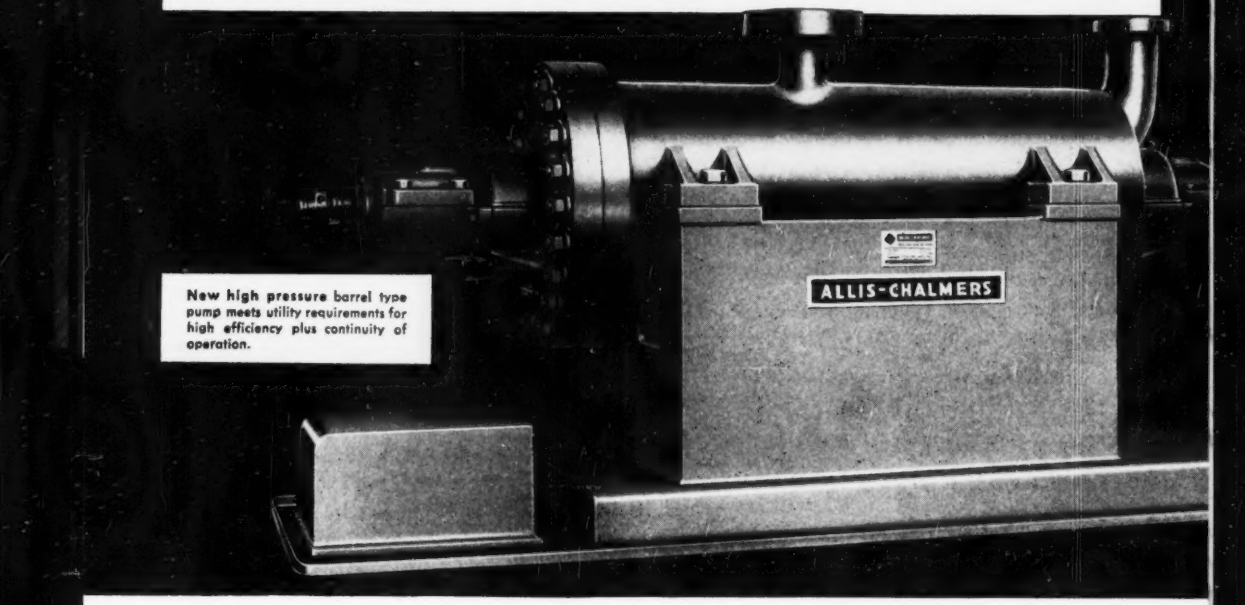
Here's how Allis-Chalmers is set to help, by providing high pressure steam stations with:

- efficient and compact barrel type boiler feed pumps of single suction design with impellers back-to-back, and radially balanced volutes in a split inner casing;
- space-saving vertical circulating pumps designed specifically for continuous power station duty;
- two-pole boiler feed pump motors for year after year dependability;
- tube-type Totally Enclosed Fan Cooled motors for other plant auxiliaries. These are ideal for outdoor applications or for indoor service in dirty locations, and take a load off the maintenance budget.

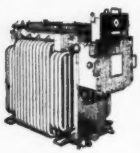
In planning new plants or changing existing plants, look at the true cost of auxiliaries as well as that of actual generating equipment. Ask your nearby Allis-Chalmers sales representative about these pumps and motors.

ALLIS-CHALMERS, 932A SO. 70 ST.
MILWAUKEE, WIS.

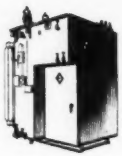
A-2800



New high pressure barrel type pump meets utility requirements for high efficiency plus continuity of operation.



NETWORK TRANSFORMERS — provide dependable metropolitan power by sturdy construction that beats corrosion, flooding, submersion. Nearly 1,000,000 installed kva have proved the reliability and economy of these compact units in densely loaded areas.



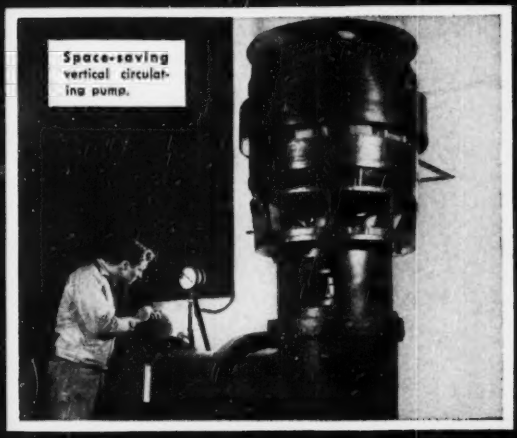
UNIT SUBSTATIONS — illustrate A-C pioneering. Combined are: ⅝% step regulation (originated by A-C); metal-clad switchgear introduced to the U.S. by Allis-Chalmers; and transformers backed by 50 years of design experience.

ALLIS-

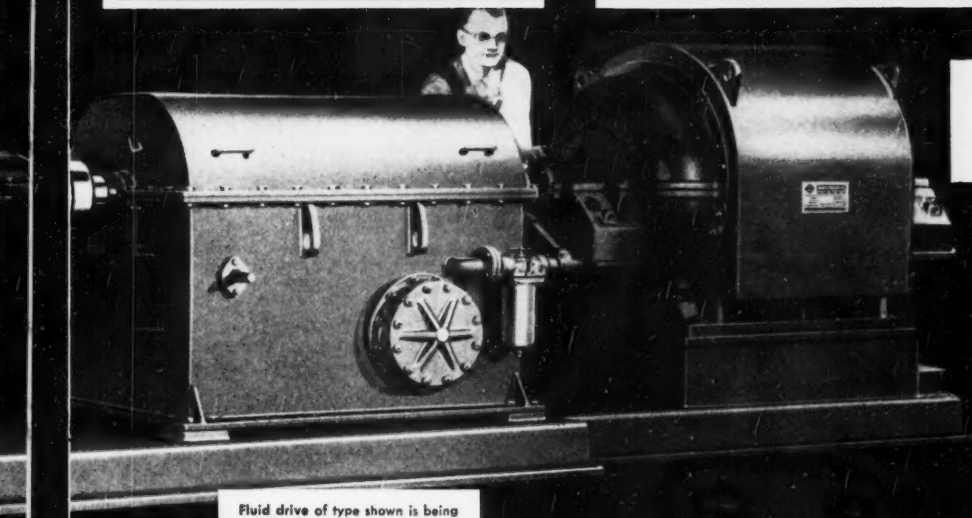
Pioneers in Power

Trim Operating Costs

Tube-cooled, Totally Enclosed Fan Cooled motor cuts maintenance because straight tubes are self cleaning — simple to swab out if needed.



Space-saving vertical circulating pump.



This two-pole squirrel cage motor is a dependable, high performance motor. Features low maintenance, long life.

Fluid drive of type shown is being furnished on several new installations to provide variable speed.

CHALMERS

and Electrical Equipment from Generation through Utilization

A-C ALLIS-CHALMERS

For ALUMINUM

that gives you more and can cost you less . . .

SYMBOL OF SERVICE

THERE ARE many reasons why it's to your advantage to look to us for all your aluminum needs. Here are a few of them:

1. **You get Reynolds Lifetime aluminum that's guaranteed as to uniformity of size and thickness; of alloy, temper, and other physical characteristics.**
2. **You know that you are obtaining your aluminum from a well-known, dependable source.**
3. **You have the assurance that your aluminum will be packaged carefully. Thus, the contents will arrive undamaged—without water stains, bending of material, injury to corners, or surface scratches.**
4. **You have the additional valuable advantage of our metallurgical advice and assistance in problems of application.**

And, what's very important, we can show you how it can cost you less when you place your orders for aluminum with us. So, whenever you need aluminum, remember that your best source of supply is United States Steel Supply. For prompt, courteous service, just phone, wire or write the warehouse or sales office nearest you.

UNITED STATES STEEL SUPPLY COMPANY

Warehouses: BALTIMORE · BOSTON · CHICAGO
CLEVELAND · LOS ANGELES · MILWAUKEE · MOLINE, ILL. · NEWARK · PITTSBURGH
PORTLAND, ORE. · SAN FRANCISCO · SEATTLE · ST. LOUIS · TWIN CITY (ST. PAUL)
Also Sales Offices at: KANSAS CITY, MO. · PHILADELPHIA · TOLEDO · TULSA · YOUNGSTOWN
Headquarters Offices: 208 S. La Salle St.—Chicago 4, Ill.

UNITED STATES STEEL

where there's profitable production

there's good light!

This Twin High-Bay Mounting Fixture is typical of the hundreds of types and sizes of Appleton Lighting Fixtures.

APPLETON LIGHTING EQUIPMENT

The Appleton Type EFU Explosion-Proof Fluorescent Lighting Fixture, first of its kind ever to be developed. Appleton Explosion-Proof Lighting Fixtures include types and combinations to meet the requirements of all hazardous locations in industry.

WHEN YOU PLAN industrial lighting with Appleton equipment the result is a finely coordinated system that paves the way for top worker efficiency and better production. That's because Appleton fixtures are scientifically designed to provide proper illumination for any given working area, whether indoors or out.

The manufacture of Appleton Lighting Equipment is quality controlled from drawing board to final delivery. Reflectors are made of pure ingot iron, finished with vitreous-fired porcelain enamel for rugged weather resistance. Appleton sectionalized construction assures easy, economical installation, quick convenient servicing.

Whatever your lighting requirements, there's an Appleton Fixture that exactly suits the purpose. For better lighting that spells better production, specify Appleton—STANDARD FOR BETTER LIGHTING.

Write for complete catalog information

Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY

1705 WELLINGTON AVENUE • CHICAGO 13, ILLINOIS

Branch Offices: NEW YORK, 50 Church St. • DETROIT, 3049 E. Grand Blvd. • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna St. • ST. LOUIS, 420 Frisco Bldg. • LOS ANGELES, 100 N. Santa Fe Avenue • ATLANTA, 724 Boulevard, N. E. • BIRMINGHAM, 429 Brown-Marx Bldg. • MINNEAPOLIS, 305 Fifth St., S. • PITTSBURGH, 414 Bessemer Bldg. • BALTIMORE, 100 E. Pleasant St. • BOSTON, 10 High St. • DENVER, 1921 Blake St. • PHILADELPHIA, 1017 Cherry Street • CINCINNATI, 626 Broadway • HOUSTON, 738 M. & M. Bldg.

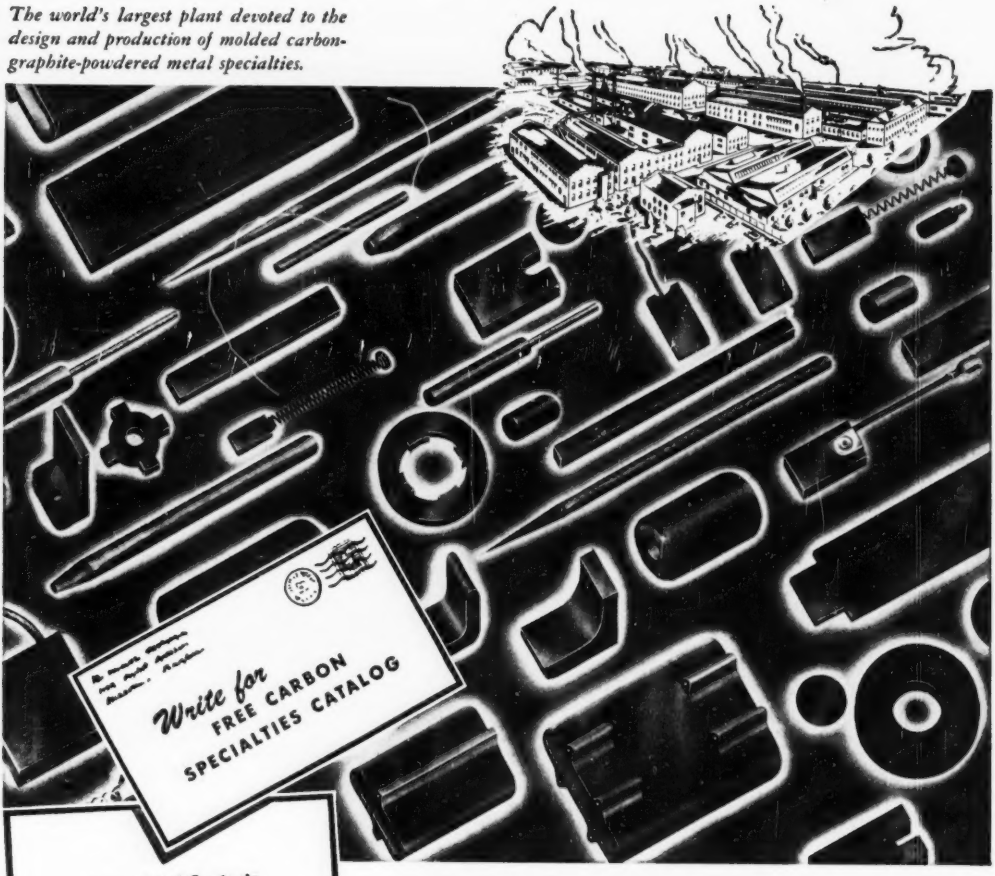
Resident Representatives: Dallas, Indianapolis, Jacksonville, Kansas City, Milwaukee, Seattle
Export Representatives: International Standard Electric Corp., 67 Broad St., New York 4, N.Y.

APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

PACIFIC ELECTRIC

The world's largest plant devoted to the design and production of molded carbon-graphite-powdered metal specialties.



Rare Metal Contacts
Brushes and Contacts
(all carbon, graphite, metal and composition types)
Anodes • Electrodes
Bearings
Welding and Brazing Products
Carbon Pipe
Chemical Carbons
Power Tube Anodes
Sintered Alnico II
Flashlight Battery Carbons
Packing, Piston and Seal Rings
Rheostat Plates and Discs, etc.

Stackpole Electronic Products
Fixed and Variable Resistors
Iron Cores
Switches—Line and Slide types to 3 amps.

CARBONS, GRAPHITES AND MOLDED METAL COMPOSITIONS

Here you see just a few of thousands of molded carbon, graphite, powdered metal and composition components manufactured by Stackpole. What you *don't* see is the tremendous background of engineering experience that goes into their production. And *that* makes a difference! It eliminates guesswork. It means that each particular product is made to conform EXACTLY to its own specific operating conditions. It means longer, more dependable service.

We can't sell our experience . . . you get that free. Yet it's the most valuable part of every Stackpole product you buy!

STACKPOLE CARBON CO., ST. MARYS, PENNA.

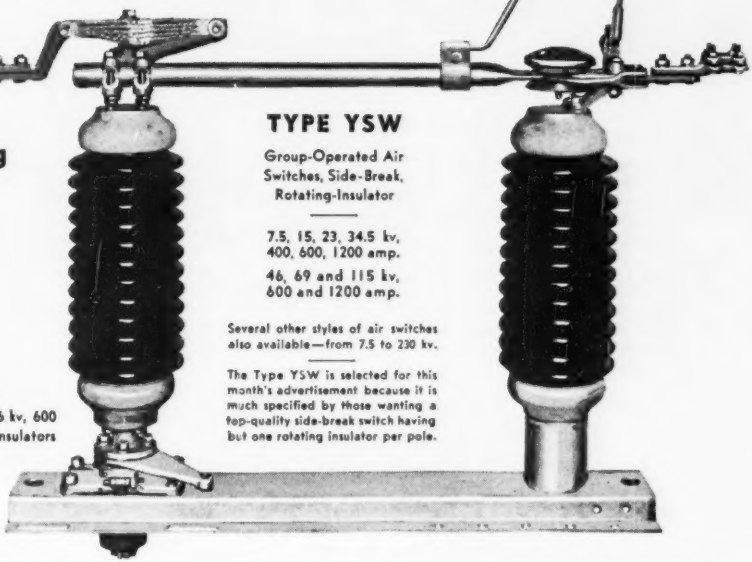
STACKPOLE

PACIFIC ELECTRIC
Type YSW
SWITCHES

Carry the Load through Solid-Silver Rolling Contacts

Assure Cool Operation and Easy Opening

Special Ice-Breaking Features



Showing Type YSW, 46 kv, 600 amps, with Post-Type Insulators

N E M A Standards

TYPE YSW

Group-Operated Air Switches, Side-Break, Rotating-Insulator

7.5, 15, 23, 34.5 kv, 400, 600, 1200 amp.

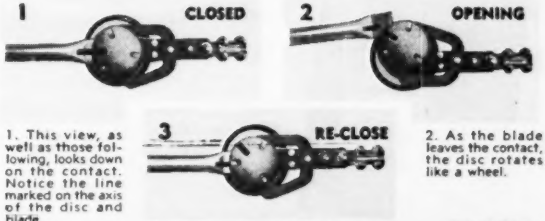
46, 69 and 115 kv, 600 and 1200 amp.

Several other styles of air switches also available—from 7.5 to 230 kv.

The Type YSW is selected for this month's advertisement because it is much specified by those wanting a top-quality side-break switch having but one rotating insulator per pole.

- Solid-silver inserts in rolling discs permit high-pressure contact (adjustable up to 80 lb), yet assure easy opening or closing.
- Floating self-aligning roller-contact design, as illustrated, assures easy operation, always.
- Ice is broken progressively because discs swivel sideways before starting to rotate.
- Rotating insulators have widely spaced ball or roller bearings with weather shields. All parts non-ferrous above insulator caps.
- Operating linkage for 3- or 6-pole switch has stainless-steel pins and mostly anti-friction sleeve or roller bearings.

How the Exclusive Rolling Contacts Reduce Friction, "Run" Cooler, and Assure Easier Operation



1. This view, as well as those following, looks down on the contact. Notice the line marked on the axis of the disc and blade.

2. As the blade leaves the contact, the disc rotates like a wheel.

3. The next time the blade enters contact, an entirely new contact position is presented to the blade.

Get All Facts . . .

Send for Catalog 130

Call

PACIFIC ELECTRIC MFG. CORPORATION

5815 THIRD STREET, SAN FRANCISCO 24, CALIFORNIA • P. O. BOX 419, GARY, INDIANA

C. H. CUTTER, 912 Securities Bldg., Seattle 1, Wash. — PIERCE G. FREDERICKS, 90 West St., New York 6, N. Y. — J. E. REDMOND SUPPLY CO., 625 W. Madison St., Phoenix, Ariz. — ORMONDE SMITH, JR., 3842 Palm Ave., Houston 4, Texas — MARRS & WENDEGATZ, 526 Dwight Bldg., Kansas City 6, Mo. — L. CLAIR MITCHELL CO., 326 Commonwealth Annex, Pittsburgh 27, Pa.

F. W. GORMAN ELECTRICAL EQUIP. CO., P. O. Box 223, El Paso, Texas — 4547 Maidan Ave., Cleveland 3, Ohio — G. B. KIRKWOOD, 437 S. Hill St., Los Angeles 13, Calif. — ARKANSAS ELECTRIC CO., 316 Louisiana St., Little Rock, Ark. — WILLIAMSON & WILMER INC., 6 T Mutual Bldg., Richmond 19, Va. — LEONARD M. SLUSSER, 18 Dooly Bldg., Salt Lake City 1, Utah

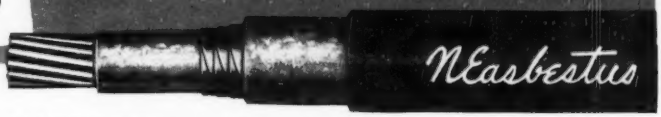
Other Representatives in Principal Cities

HERE'S THE WIRE FOR EVERY HOT SPOT LOCATION

NATIONAL ELECTRIC...

TWO TYPES TO MEET ANY "HOT SPOT" NEED

NEasbestus Wire & Cable



ASBESTOS-VARNISHED CAMBRIC—Recommended for conduit, raceway or open wiring in boiler rooms, steel mills, power plants, steam tunnels and factories where heat, moisture, corrosive fumes, oil and fire hazards are present.

Sizes 18 AWG to 1,000 MCM. 600-volt to 8000-volt ratings. Maximum operating temperatures up to 110° C. (230° F.) for 600-volt wire; up to 100° C. (212° F.) for 5000-volt wire.

ALL-ASBESTOS—Recommended for motor connections, crane and engine compartment wiring, electric furnace leads and other open wired, high temperature installations in dry locations.

Sizes 18 AWG to 1,000 MCM. 300-volt and 600-volt ratings. Maximum operating temperatures up to 200° C. (392° F.) for 300-volt wire and 125° C. (257° F.) for 600-volt wire.

Resists HEAT . . . MOISTURE . . . OIL . . . GREASE . . . FUMES

Write for your copy of the new catalog *"NEasbestus Wire for Hot Spots."* It will give you detailed information on sizes, ratings and recommended uses.

NATIONAL ELECTRIC PRODUCTS — WIRING SYSTEMS — WIRES AND CABLES

National Electric
PRODUCTS CORPORATION
1305 CHAMBER OF COMMERCE BLDG., PITTSBURGH 19, PA.

Discrimination

AT THE CONTROLLER'S Institute meeting in San Francisco, Charles Eble, controller of the Consolidated Edison Co of New York, Inc, gave an analysis of the present tax problems of the privately owned public utilities. He discussed the degree of tax responsibility for the scarcity of equity capital, the meaning of double taxation in the utility field, and placed special emphasis on the discriminatory taxes which are imposed on utilities and their customers. Included were the favored tax treatment accorded publicly owned systems and governmental bonds, the uneconomic Federal Electrical Energy Tax of 3-1/3%, and excise taxes on appliances.

At the same time, the Alabama Power Co is fighting an increase in tax assessments of 25%. Additional discrimination exists there because ad valorem levies on other property are not being raised.

Within the industry, such conditions are well known. Public attention has been sought by use of the standard phrase "business-managed, tax-paying utilities." Additional stress has been given to this matter in the continuing campaign of the National Tax Equality Association. But in all these activities there seems to have been a reaction from the public in the way of a blank stare. There has been no measure of popular demand for removal of discriminatory taxes. Until such demand exists in a majority who are willing to express themselves through legislative channels, success in producing corrective action will be found only at the bottom of the rainbow.

Electricity may be cheap in Milwaukee, but it is high time the people were convinced as to how cheap it would be without taxes. There is no industry more willing to bear its full share. But little credit is accruing in its favor in return for this public-spirited attitude.

The problem of discriminatory taxation has gone far beyond an acceptable margin. The pendulum has been suspended way off center with no indications that it will return in its normal orbit. The cause of unfair taxation must become an important part of the utilities information program. Now is the time to start active campaigning to secure corrective measures in 1950. Such adjustments will not come from high level conferences alone. The employees, customers, and stockholders must as a body rise up in opposition.

To gain such unanimous support will require immediate action in all channels available for contacting these taxpayers who don't see the hidden collector. Otherwise 1950 will pass on into history with more taxes and fewer to pay.

Dedicating Ourselves

"A RECENT RESEARCH by Central Surveys, showed that three out of every five persons questioned among opinion-forming groups thought the trend toward greater government influence was pronounced, regarded this trend as harmful, and believed it will affect them adversely."—"Only one in seven could recall any specific activities in which he had engaged to stem the tide"—"Two in every five don't know what they can do."

With these remarks, Elmer Lindseth, president of Edison Electric Institute, lays the ground work for showing "that effective and sensible opposition can be marshaled against undesirable trends" in his current speech entitled, "What Can One Man Do?" Those in the industry to whom Lindseth has presented this program may be among the one in seven who could recall specific activities to stem the tide. But it is safe to say that few can claim to have adhered to all six points.

Then there are those in the industry who think that the danger is too far away for serious efforts on their part. It would be surprising to find many of these who would solicit other workers to help the cause.

So the problem is one of beginning right at home in the industry—dedicating themselves to the objectives, then teaching others. In case you haven't heard, this is what one man can do according to Lindseth—

"First, we have got to get informed. We must educate ourselves on the economics of the American system.

"Second, we must recognize that many proposals for reforming the American economy stem from real problems.

"Third, we must be for right things, not merely against wrong things.

"Fourth, we must spread the story of the American system in terms everyone can understand and accept.

"Fifth, we must take a more alert personal interest in government, and implement our interest by personal action.

"And sixth, we must truly deserve the confidence of the people."

Carrier Has Multiple Functions

MOST OF THE literature about carrier current points out that it is useful for communication, relaying, supervisory control, and telemetering. In fact the cost of the coupling and terminal facilities is such that installation on some short lines had to await evidence that the equipment could be used for more than one purpose and thus justify itself.

Nevertheless the general evidence seems to indicate that only 10% of the carrier links in service are utilized for two of the above functions and only 1 or 2% are utilized for more than two. For example, 8 utilities in a well-knit area have 172 carrier links working on 85 frequency channels from 6.25 kc to 245 kc. Of these 41 are used solely for communication purposes, 36 for relaying, 5 for control, and 8 for telemetering. Sixteen links are used for combinations of two functions and just one link for three purposes.

This wide disparity between potentiality and claims on the one hand and actual application on the other hand is worthy of examination. Either the proponents of carrier assumed too much or the purchasers are overlooking an opportunity to realize more on an investment already made.

As for deriving communication or relaying from carrier channels now devoted only to the opposite function, there should be no reluctance to combine the two lest a conversation interfere with the execution of automatic fault clearing by the relays. There are established methods for giving unimpeded priority to the relaying signals by automatically interrupting the telephone conversation. The same is true of combinations of either with control or telemetering. The facilities are accommodating in this respect.

There probably are reasons why such limited use has been made of carrier currents. One would conceivably be that there is usually more need for communication and/or relaying than for control or telemetering. The rejoinder to this is that the latter can be provided at little extra cost once the investment in carrier has been made. There may be some good reasons why carrier is not fully utilized in some instances, but there can be few valid reasons for not finding out why it should not be in the rest of the limited-use cases.

The Test at Indianapolis

FACTS BROUGHT out in the NEMA survey of commercial and industrial lighting in Indianapolis, recently made public, are no less than startling. Over 85% of lighting surveyed was found to be inadequate. But this is less disturbing than the lack of information on proper lighting apparent among users. They obtained such information from no one at all (26%), from friends and acquaintances (10%), or from "others" (8%); a total of 44%, who, to say the least, were poorly informed. And, most startling of all, only 2% of users received lighting information directly from the electric utility. It is probable that the utility contribution was really much greater than this 2% indicates, because of channeling of information from it to users through electrical and other contractors, architects, engineers, and dealers.

Certainly, any one who can supply consulting service in this field should be given all possible aid, a large share of such aid coming from the utility. Industrial and commercial lighting are one of the best load builders for the utility.

The customer should think of the power company when he thinks of lighting. The 2% figure of the survey is a challenge to any utility folks who may be complacent about their own positions.

The Electrical Week

A new federal power agency is on its way to serve the Southeast. It will be known as the Southeastern Power Administration (Sepa). Neither the administrator nor the headquarters city have as yet been announced . . . FPC has handed down its ruling on power development on the Kings River of California. The plum will be split by the Pacific Gas & Electric Co and the Fresno Irrigation District . . . The scrap between UE and the new IUE-CIO for control of all the workers formerly ruled by UE will have its effect on the electric utility industry. Production delays are expected at the manufacturing plants which produce the heavy equipment used by the industry . . . The Democrats have postponed their New England parley to promote hydroelectric development in that area. But they promise a "bigger and better" meeting in January when the President will be free to take part . . . And in Ohio action has started by Ohio Edison Co to take over Ohio Public Service Co.

Power companies have at least two months to restore strike-depleted coal stocks. If Lewis and mine operators haven't settled by Dec 1, the government will intervene to prevent another mine shutdown. Result will be a federal fact-finding board, with 60 days' grace, if Lewis agrees, or an 80-day Taft-Hartley injunction, if he doesn't.

As predicted (EW, Oct 29, p 6), TVA will power wind tunnels and the air engineering development center. Site for the center will be Camp Forrest, Tenn., it was disclosed last week. President Truman has signed a bill providing $100 million for starting work on the new center.

Don't bet that Mon Wallgren will become chairman of Federal Power Commission—not this year, anyhow. In fact, you can bet against it.

Only a severe drought can prevent Canadian central stations from setting a new output record in 1949.

Top electricity producers among nations in 1948 were the United States, 336,808,000,000 kwhr; Russia, 60 billion kwhr; Canada, 54,110,000,000 kwhr; and the United Kingdom, 46,536,000,000 kwhr.

Situation Wanted Dept.: "Cap" Krug had no other important job lined up when he quit as Interior Secretary last week.

REA's looking around for personnel to man its new farm phone program. One guess is that 100-200 new jobs will open up in the agency as the new project develops.

Cleveland municipal executives are considering switching from coal to oil as a power plant fuel. Reasons: Less smoke and escape from fuel shortages caused by coal strikes.

Indian electrical generating capacity rose only 3% during 1948, but better spreading of supply and working hours brought a 12.3% increase in production.

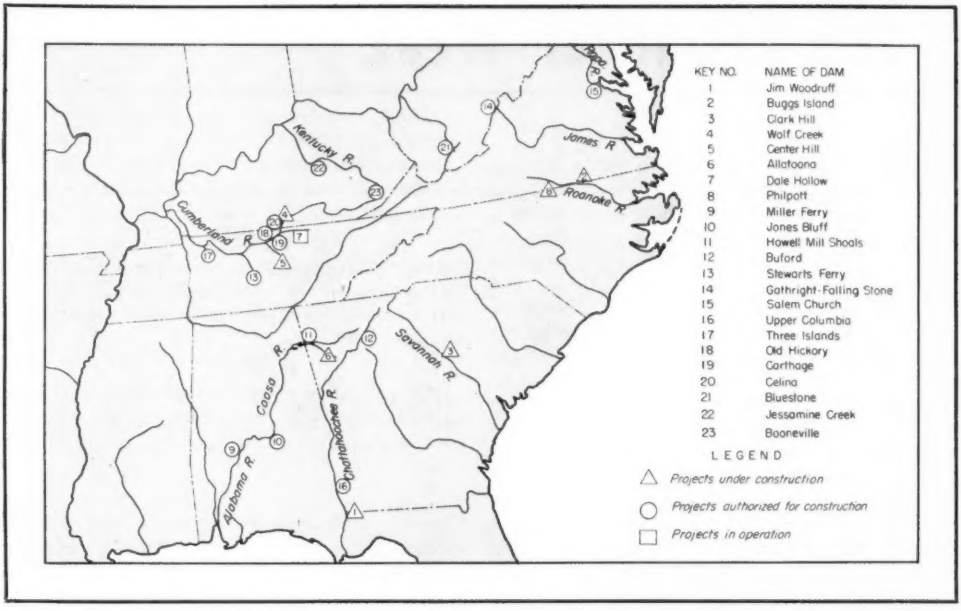
There are only 87 unelectrified farms in Rhode Island. In Mississippi there are 134,055, over 10% of all such farms in the U. S.

With the steel and coal strikes apparently settled the big question for the electric utility industry is, "How soon will output top 6 billion kwhr in a week?"

In the past year, approximately 10,000 employees have been added to the list of Westinghouse stockholders.

Notes From The News

Toledo Edison Co has asked the City of Toledo to pay an estimated 24.5% more for energy supplied to the city for overhead and underground lighting in the city's downtown and residential areas . . . Appalachian Electric Power Co has leased the power plant at the Radford (Va.) Arsenal . . . A California judge not only refused to hear a $300,000 damage suit against Pacific Gas & Electric Co but also told the plaintiffs that by striking a 26-ft-high power line with their airplane they were actually trespassing on PG&E property . . . Dr. Lee De Forest, pioneer radio inventor, told the FCC that neither of the two major color television systems is ready for commercial use . . . Assessed value of Oregon's electric utilities is now $81,033,763, up $9,388,156 from last year.



New U. S. Agency to Serve Southeast

Southeastern Power Administration Will Market Energy from Hydro Projects Built by Army Engineers; Headquarters and Administrator Not Yet Selected

A NEW POWER business will be born formally within a few weeks. With an initial $70,000 to set up shop, the new organization hopes to realize an annual gross revenue in excess of $10 million within four years.

It's a new federal power venture, the Southeastern Power Administration (Sepa). Like its operating counterparts, Bonneville Power Administration and Southwestern Power Administration, Sepa will be a Department of the Interior Agency which sells hydroelectric power produced at dams built by the Army Engineers.

Within a few weeks, Interior will name the new power agency's first administrator—probably a field official from the Bureau of Reclamation—and a staff will be chosen. Another early problem will be selection of a site for Sepa headquarters. This will probably be in the Carolinas or Georgia, with Columbia, S. C., and **Augusta, Ga.,** among the possibilities. The latter would be close to the biggest power producer now contemplated for Sepa, the 280,000-kw Clark Hill Dam on the Savannah. Final choice may rest with the new administrator.

Although not even christened, Sepa is far from an unknown quantity, with its shape and size pretty clear before it begins formal operations. Territory within which power from Engineer dams will be marketed stretches from the Mason-Dixon line to the Gulf of Mexico, from the Atlantic to the Mississippi.

The new federal power agency will sell the output of hydro plants at two dams with more than 100,000-kw total capacity within its first few months. By 1953, Sepa's power will come from plants at eight dams with a capacity of some 1 million kw. Gross revenue in 1950 may be $1 million, by 1953, closer to $10 million.

The eight dams range in capacity from Clark Hill's 280,000 kw down to Philpott's 14,000 kw on the Smith River, a Virginia tributary of the Roanoke. One plant, at Dale Hollow on the Obey River in Tennessee, is now operating—a second, Allatoona on the Etowah River in Georgia, is slated to begin operation in January. The other six are now under construction and scheduled to be completed at various dates during the next four years. In addition, 15 more projects in the Southeast with an estimated potential capacity in excess of 1 million kw have been authorized by Congress for future construction.

Within four years, Sepa may be marketing as much as 10% of the power capacity (estimated by EEI at 11.3 million kw in 1952) in the huge territory it will cover.

Father of Sepa is Interior's Power Division chief, Walton Seymour, who asked Congress this year for an $85,000 chunk of the $500-million Interior Department appropriation to open the business. He obtained $70,000, which will finance Sepa through next June.

Seymour, who came to the Department in 1947 after 13 years with TVA, has negotiated two contracts for Interior which will be inherited by Sepa. One sells the output of the 36,000-kw Dale Hollow plant to TVA. TVA also can expect to get the output of an added 18,000 kw from Dale Hollow and the output of two Cumberland River projects, Wolf Creek and Center Hill.

Southeastern Hydroelectric Projects — U. S. Army Engineers

Dam	River	State	Initial Capacity (kw)	Ultimate Capacity (kw)
	OPERATING			
Dale Hollow	Obey	Tenn.	36,000	54,000
	UNDER CONSTRUCTION			
Jim Woodruff	Apalachicola	Fla.	30,000	30,000
Buggs Island	Roanoke	Va.	108,000	204,000
Clark Hill	Savannah	Ga.	280,000	280,000
Wolf Creek	Cumberland	Ky.	135,000	270,000
Center Hill	Cumberland	Tenn.	135,000	135,000
Allatoona	Etowah	Ga.	72,000	108,000
Philpott	Smith (Roanoke)	Va.	14,000	13,400
			774,000	1,041,000
	AUTHORIZED FOR CONSTRUCTION			
Miller Ferry	Alabama	Ala.	.....	76,000
Jones Bluff	Alabama	Ala.	.....	68,000
Howell Mill Shoals	Coosa	Ala.—Ga.	.....	105,000
Buford	Chattahoochee	Ga.	.....	77,000
Stewarts Ferry	Stone (Cumberland)	Tenn.	.....	13,500
Gathright-Falling Stone	Jackson (James)	Va.	.....	34,000
Salem Church	Rappahannock	Va.	.....	81,750
Upper Columbia	Chattahoochee	Ala.—Ga.	.....	130,000
Three Islands	Harpeth (Cumberland)	Tenn.	.....	20,000
Old Hickory	Cumberland	Tenn.	.....	120,000
Carthage	Cumberland	Tenn.	.....	90,000
Celina	Cumberland	Ky.	.....	60,000
Bluestone	New	W. Va.	.....	180,000
Jessemine Creek	Kentucky	Ky.	.....	14,000
Booneville	So. Fork Kentucky	Ky.	.....	7,300
				1,076,450
Grand Total			810,000	2,171,450

within three to four years. Thus, TVA with 459,000 kw of Sepa's first million kw, will be the new power seller's leading customer.

A second contract has been signed with Georgia Power Co for the output of the 72,000-kw Allatoona Dam. Under terms of this contract, the government may withdraw up to 2.5 million kwhr per week for delivery to preference customers.

The present contract does not provide for wheeling, and the government withdrawal would be made at the plant, with the company firming up the less than 2 million kwhr of continuous firm power produced in a week. Provision is made for negotiations for wheeling agreements at any future time. Meanwhile, no wheeling problem has loomed. No preferred customer has been found for Allatoona power.

Although Sepa will resemble SPA and Bonneville, its leading proponent sees it as a new and unique operation. Seymour points out that the extensive power networks of the Southeast differ from the vast, open reaches of SPA's area, and Sepa's place in its area's power market will contrast sharply with the dominant position of Bonneville's Columbia River plants in the Northwest.

Despite these and other differences, Sepa will be doing the same basic job as SPA and Bonneville and will be selling and transmitting power on the same preferred customer basis. At present, Seymour says, the extensive power network of the territory does not provide facilities to carry the 1 million kw which will be coming in at the area's federal power plants. Who will build these lines and where is a major question mark in the new power agency's future.

Sepa already is involved in a major case before the Federal Power Commission. Interior is opposing the application of the Virginia Electric & Power Co to construct a hydroelectric dam at Roanoke Rapids. If Interior's position is upheld by the Commission, federal power produced at the site will be sold by Sepa.

•

Air Pollution Cost to U. S. Set at $1.5 Billion Yearly

Direct economic losses due to air pollution cost the U. S. $1½ billion annually. This is the estimate of W. B. Gibson, Stanford Research Institute. Speaking before a national air pollution symposium in Pasadena, Calif., Nov 10-11, he estimated that well over $100 million net is being expended annually to control air pollution and reduce these losses.

He cited Detroit Edison Co as an example of an electrical utility which through sale of recovered fly ash had actually realized a profit on equipment installed to reduce pollution. However, he said that of over 300 major industrial installations indexed in a recent survey, only 25% returned any profit. Air pollution control, he warned, is a costly undertaking, and the point of diminishing returns must be determined in establishing how far to go.

Industry-Wide Education Plan Gets NECA Okay

An industry-wide educational program to acquaint the public with the need for electrical modernization was adopted by the National Electrical Contractors Association at its annual convention last week at Houston.

The program is designed to promote electrical adequacy in all of its applications. All branches of the electrical industry are being asked to participate in this general educational program, which will include the established industry promotional efforts such as Adequate Wiring and Planned Lighting.

EDWARD J. VANDERLINDE

Edward J. Vanderlinde, Vanderlinde Electric Corp, Rochester, N. Y., was elected president. He succeeded R. W. McChesney, Washington, who has been president for the past ten years.

Vice-Presidents elected were W. E. Frazer, Philadelphia, District 2; Leon G. Granger, Hammond, Ind., District 4; J. D. O'Connor, Sacramento, Calif., District 6; and J. E. Collier, Denver, District 8.

•

Municipal Gets Utility Aid

The coal shortage has forced the municipal power plant at Clyde, Ohio, to supplement its energy output with electricity from Toledo Edison Co. Caught with less than a week's supply of coal, the municipal asked Toledo Edison aid under an emergency contract in effect for more than 20 years. The power shortage in Clyde is the first to affect a utility in the northwestern Ohio area.

FATHER, MOTHER, and the children, too, study model of radial flow surface condenser at the Barbadoes Plant of Philadelphia Electric Co. Nearly 25,000 persons toured the plant, which was open for inspection during Pennsylvania week following dedication of two units

Pacific G&E Gets FPC Approval for Kings River Power Development

KINGS RIVER, Calif., power will be developed by the Pacific Gas & Electric Co and the Fresno Irrigation District, the Federal Power Commission ruled Nov 10. In effect FPC told the Bureau of Reclamation its plans for the river's power development (EW, Nov 5, p 61) were too little and too late.

Also revealed in FPC's opinion were views hinting at another defeat for Interior in its battle against private development of the Roanoke River in Virginia. In both cases, Interior argued against federal licenses for power plants on streams suggested for future federal development.

In its action last week, FPC authorized a license to PG&E for installation of a total of 274,000 kw on Kings River. For the same developments, the Fresno Irrigation District has proposed to install 144,000 kw. Bureau of Reclamation plans called for only 101,500 kw.

A preliminary permit for investigation of the power development of the Pine Flat Dam, now under construction on the north fork of the river by the Army Engineers, was issued to the Irrigation District. PG&E made no application for this project, but Reclamation had plans for an eventual 45,000-kw plant at Pine Flat.

Included in conditions of the license granted PG&E is an increase from 31,500 kw to 115,000 kw in the capacity of the Balch Plant, which the company owns. Both Reclamation and the Irrigation District had proposed acquisition of this plant as a part of their plans. Another total of 159,000 kw will be installed at the Wishon, Haas, and main stem King River sites by the company under the new licenses.

The decision reversed the recommendations of an FPC examiner, who found that the public interests would "best be served" by federal development. The opinion of the Commission was signed by all five members. It was the first major opinion in which Commissioner Mon C. Wallgren has participated.

Commenting on the plans submitted by Reclamation, the opinion said, "We are confronted with the suggestion that we should withhold approval of the pending applications and reserve development of these water resources exclusively for the United States and the possibility that at some time in the future a more economic plan of development may be worked out."

Both PG&E and the Fresno District "have submitted proposals for more complete development than that proposed by the Bureau," the Commissioners declared. "Under these circumstances it does not appear to us to be in the public interest to allow these water resources to remain idle."

Although the Kings River is in the general area of the Central Valley of California, the opinion held that the proposals for water power use put the development under the Federal Power Act.

In the Roanoke Rapids case, now before FPC's chief examiner, Virginia Electric & Power Co has applied for a license to construct a hydroelectric plant at a site included in plans for development drawn up by the Army Engineers and approved by Congress. Congress has not, however, authorized federal construction at Roanoke Rapids.

•

East Coast Utilities Co Purchased by Vepco

Virginia East Coast Utilities Co has been sold to Virginia Electric & Power Co. East Coast shareholders will swap one share of common for one of Vepco and will receive in addition a share of East Coast's undivided surplus as a dividend. The exact amount cannot be estimated but is likely to be $1.25 or more a share.

Directors of both companies have approved the transaction. East Coast stockholders, the Federal Power Commission, and the Virginia Corporation Commission must yet approve. But it is unlikely that there will be much opposition to the sale.

East Coast serves tidewater Virginia between the Potomac and York Rivers. It buys most of its energy from Vepco, having only a few peaking power plants. Its 16,327 customers will push Vepco's total close to the 500,000 mark.

Lower Vepco power rates will be introduced into the East Coast area. All employees of the purchased company will be retained. Francis K. Godwin, East Coast president, will join the Vepco staff at Richmond in an undisclosed capacity.

•

French Plant Approved

A 100,000-kw steam generating plant is to be erected at Dechy, France. The Economic Cooperation Administration has approved $15 million in ECA funds. The French government will supply $4.5 million. The plant, located in the Pas de Calais region, will use waste coal for fuel.

•

Utility Sale Approved

San Gorgonio Electric Corp has received authorization from the California Public Utilities Commission to sell its properties to the California Electric Power Co.

FRED M. KELLEY, left, and James B. Carey lead the new right-wing CIO electrical union

UE Scrap with CIO Threatening Production of Electrical Equipment

By Joe Gambatese

PRODUCTION of electrical equipment for the next year or more may be one of the casualties in union feuding now flaring up in major manufacturing plants. Whether the drop in production will be sufficient to tie up electric utilities' expansion programs depends on how violent the feuding becomes. But the threat is there.

The equipment makers already are squarely in the middle of high-pitched union electioneering, more intensive than that which swept the industry in the mid-'30's. Strikes, though possible, are not imminent. More likely is a general lowering of production, stemming from disorder in plants stirred by the inter-union struggle.

That was the outlook this week as major manufacturers generally took a hands-off position in the bitter fight between the United Electrical, Radio & Machine Workers of America and CIO'S new International Union of Electrical, Radio & Machine Workers.

Westinghouse and General Electric continued to deal with the same union representatives — UE — despite telegrams sent to more than 1,000 employers with UE contracts by James B Carey, chairman of the 12-man administrative committee guiding the new CIO union. Carey demanded that employers give recognition to IUE-CIO instead of UE, which was a CIO affiliate until its expulsion on Nov. 2.

Through Vice-President L. R. Boulware, General Electric told Carey the company's policy required it to deal with the duly certified union. Boulware called Carey's attention to procedures available to him under the Taft-Hartley law for establishing IUE-CIO's right to speak for GE's 125,000 employees now represented by UE.

Allis-Chalmers took a different approach. It exercised its own right under Taft-Hartley to petition the National Labor Relations Board to resolve conflicting claims of the two unions for bargaining rights. Affected are A-C's switchgear plant at Boston and its Norwood, Ohio, plant. The CIO Auto Workers holds contracts at most of the company's other plants.

Whatever procedure is followed, new certifications will be sought from NLRB, either by employers or IUE-CIO. They will be requested whether or not any local unions pull out of UE and join IUE-CIO. This will mean elections—which distract workers from their jobs. Where the rivalry is hottest, work interruptions will be more pronounced.

IUE-CIO has filed petitions with NLRB asking for certification as bargaining agent at GE, Westinghouse, Allis-Chalmers, General Motors, and four other companies.

Electric utilities, with huge equipment orders still to be delivered, will be among the first to feel a real slowdown of production. The battle of the unions will be most furious in the largest plants of Westinghouse and General Electric. Both unions will concentrate on winning these on the theory that the victor there will dominate the entire industry. And to win Westinghouse and GE, a union must win their big plants. The big plants, of course, are where much of the equipment bought by utilities is produced.

Schenectady Fight Likely

Focal point of the feud may be Schenectady, where GE makes turbines, generators, controls, and cable. The 15,000-member UE Local 301 there has right-wing officers and a left-wing executive board.

The fight will be hot, too, at GE's Lynn, Mass., operation, producing meters, instruments and street lighting equipment. Fred M. Kelley, business agent of the 16,000-member Local 201 there, has been a leader in the rebellion within UE. Kelley, who ran unsuccessfully against UE President Albert J. Fitzgerald at UE's convention in September, has strong backing to head the new IUE-CIO. Fitzgerald also is a member of Local 201.

Other GE trouble spots are likely to be Pittsfield, Mass., where transformers, lightning arresters, cut-outs, and capacitors are produced, and Philadelphia, where GE makes carrier current equipment, circuit breakers, regulators, and panel boards.

Westinghouse Also Threatened

Points to watch in Westinghouse are East Pittsburgh (generators) and South Philadelphia (turbines). Both plants are right-wing strongholds, but the leftist UE won't surrender its 20,000 dues-payers employed there without a fight.

In less than two weeks, IUE-CIO claimed to have brought about a third of UE's approximately 400,000 members under its banner. Odds are that the new union will win handily in GE, Westinghouse, and General Motors' Electric Division.

The new union will get its formal start in Philadelphia on Nov 28, when the first constitutional convention will be held. Election of officers will be postponed, avoiding an immediate showdown between Carey and Kelley over the presidency. Carey headed UE until 1941, when the left-wingers elected Fitzgerald.

New Faces at Many Washington Desks

THE PAST MONTH witnessed a near-record turnover among top officials of federal power agencies and regulatory bodies. Counting the impending departure of Interior Secretary Krug (p93), no less than seven men at policy-making levels in such agencies have left Washington or started packing.

HARRY A. McDONALD

Sheer partisan politics had little to do with the shifts that have developed. In fact one important change, the elevation of Harry A. McDonald to the chairmanship of Securities and Exchange Commission, was in defiance of ordinary political practice. McDonald, a Republican member since 1947, was elected with the apparent blessing of both a Democratic President and the Democratic majority of the Commission. He succeeds Edmond M. Hanrahan who quit to return to private law practice.

This left SEC with two Republican members, McDonald and Richard B. McEntire, and Democrat Paul R. Rowen. But two Democrats, Donald C. Cook and Edward T. McCormick, were added to the Commission before it elected a chairman.

COOK McCORMICK

Death eliminated Rural Electrification Administration's Deputy Administrator William J. Neal, who ranked with Hanrahan among the government's ablest administrators. Neal was killed in an automobile accident, Oct 26, near Las Cruces, N. M., while traveling on REA business.

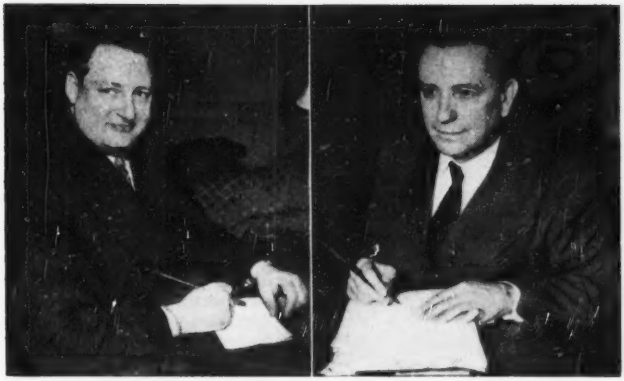
GEORGE W. HAGGARD

WILLIAM C. WISE

Into his job REA elevated Assistant Administrator George W. Haggard, who had come to the agency in January, 1948, from a state-wide organization of Texas electric cooperatives. William C. Wise, a Pennsylvanian and veteran staffer of REA, succeeded Haggard as assistant administrator.

By no means the least important of the new appointments was that of Mon C. Wallgren to the Federal Power Commission. The former governor of Washington, long a friend of Harry Truman, had been slated for a federal job ever since he lost his state job in last November's election. His appointment to FPC, however, was unexpected. It was made possible by the refusal of the Senate to reseat Leland Olds.

FEDERAL POWER Commissioner Mon C. Wallgren, left, takes oath from Chief Justice Vinson



OLD AND NEW BOSSES at Interior: Julius A. Krug, left, and successor, Oscar L. Chapman

Krug Stepping Aside for Chapman in Long-Rumored Interior Shift

A THREE-YEAR-OLD rumor caught up with Julius A. Krug last week when he finally announced his resignation on Dec 1 as Secretary of Interior. On the heels of his decision came White House appointment of Undersecretary Oscar L. Chapman as Krug's successor.

Reports of Krug's imminent departure from the Cabinet had circulated in Washington almost since his appointment to the Interior post in March, 1946. They successively had had the former War Production Board chairman quitting to take a lucrative business position, then because of poor health, and, finally, because of rows with President Truman.

In their latter stages the rumors also designated Chapman as the next Interior boss. The Chapman-for-Secretary talk originated after the 1948 election campaign, during which Interior's No. 2 official worked vigorously for President Truman's reelection.

Announcing his departure Nov 10, Krug's only comment was that he had wanted to leave "for a long time." He gave no indication of his future plans.

The rumors of Truman-Krug differences flared anew when it was learned that the President had just vetoed a small irrigation project in New Mexico for which the Reclamation Bureau had won Congressional approval.

Secretary-designate Chapman made the usual announcement: No immediate changes in Interior plans or personnel. But his appointment is expected to tie the Department more closely to the Administration, which has become increasingly interested in Interior's reclamation and power programs.

Administration political strategists have adopted both programs, especially federal power expansion, as issues for next year's Congressional campaign. They have complained in recent months of what they termed a lack of real enthusiasm within Interior for Administration-approved plans for a Columbia Valley Administration.

Chapman has pledged his support for CVA and other federal power projects, as well as for further development of the West, statehood for Alaska and Hawaii, and increased federal research in the field of natural resources. He also is expected to bring closer cooperation with other federal agencies, including the Agriculture Department and the Budget Bureau, which have been frequent critics of Interior programs in the past.

Chapman served as Assistant Secretary under Harold Ickes for 13 years, then moved up to Undersecretary when Krug took office in 1946. A 52-year-old attorney, he was born in Virginia but moved to Colorado for his health 30 years ago. He joins Agriculture Secretary Brannan as the second resident of Denver in the Cabinet.

A long-time "New Dealer," Chapman forthrightly espouses the cause of public power. He especially is convinced that the federal government must build transmission lines to carry power from its generating plants to load centers. But he also is a good organizer and probably will insist that his power agencies stop bickering among themselves and with other U. S. bureaus. This eventually may lead to some shifts in top Interior personnel.

Krug, born and educated in Madison, Wis., established a phenomenal record in his first 10 years of federal service. Starting as a public utilities expert with the Federal Communications Commission, he climbed rapidly, via the Tennessee Valley Authority, the Office of War Utilities, then chairmanship of WPB, to Interior Secretaryship. He'll celebrate his 42nd birthday next week (Nov 23).

Book of the Year

EW's 75th Anniversary edition (May 21) is now obtainable in book form under the title of "The Electric Power Industry." Publisher is the McGraw-Hill Book Co. The book is a comprehensive review and look-ahead in the engineering, marketing, organizational, financing, rate-making, and utilization sectors of the electric utility industry. Executives, designers, commercial staffs, operators, engineers, and university professors and students will find durable and authentic information in the pages.

Voters Favor Rate Cut; Utility Appeals to PUC

Columbus, Ohio, voters have approved an ordinance reducing electric rates charged by the Columbus & Southern Ohio Electric Co. The company has appealed to the Public Utilities Commission, and it is expected that the issue will finally be settled by the state Supreme Court.

The ordinance, effective Nov 15, provides for a 27% reduction in residential, 5% in commercial, and 1% in industrial rates. The new residential rate is $3.08 for the first 100 kwhr; the old was $4.20 plus a 27¢ surcharge.

City to Tax Cowlitz PUD

Kelso, Wash., City Council has levied a 5% tax on the Cowlitz Public Utility District despite protests from some consumers. The tax was passed to make up for the lost property taxes from Puget Sound Power & Light Co. It will go on November light bills.

IN CONGESTED WORCESTER frame work rises for addition to Webster Street Plant of Worcester County Electric Co. Construction is part of $9-million expansion program

Democrats Postpone New England Meet Until Truman Can Attend

DEMOCRATIC PARTY plans for a New England regional conference in Boston, Nov 20-21, collapsed suddenly this week. But Party spokesmen in Washington said the conference, designed to promote federal development of New England hydroelectric power and other political issues, had been rescheduled for the closing weeks of January.

The January "show" will be even more "colossal" than the one planned for next week, these sources predicted. Though the exact date has not yet been set, President Truman and Vice-President Barkley may attend. The President's inability to make next week's session—he's entertaining the Shah of Iran—was a contributory factor in the postponement, it was indicated.

But the major cause apparently was the death of the conference chairman, James H. Vahey of Massachusetts. Reports that the resignation of Julius A. Krug as Secretary of Interior—he was scheduled as one of the principal speakers—had upset the plans were denied by Democratic leaders. Also denied was the rumor that the meetings were called off because of objections from Republican Senator Henry Cabot Lodge of Massachusetts. Lodge urged a thorough study of the region's water resources in advance of any push for federal power development.

Utility industry reaction also developed. On Nov 16, Avery R. Schiller, chairman of the Electric Coordinating Council of New England, announced that privately owned electric utilities of the area are past the midway point in a $502-million program of expanding their facilities. Schiller pointed out that this was prime evidence of the utilities' recognition of their obligation to "supply the electrical needs of the area."

Even more emphatically than Senator Lodge, he suggested that federal power planners check the facts of New England's hydro potential before promoting projects.

The Electric Coordinating Council, an association of utility officials originally formed to aid in wartime coordination of the area's power resources, has been "deeply conscious" of possible further hydro development, Schiller asserted. But the group also has been aware that "hydroelectric developments sooner or later must be supplemented by fuel-burning plants having a capacity approximately three times as great as that of the hydroelectric plants." This is due to "the nature of the rivers of the area," Schiller said.

Since V-J Day, power companies of New England have spent $352 million for new facilities. Construction now in progress or planned will result in expenditure of another $152 million for additional plant by the end of 1952.

"While the amount of money involved is huge, this is not nearly so important as the fact that it demonstrates conclusively that the utility companies in this area recognize their obligation to supply the electrical needs of the area and have made long range plans to meet these needs, even though such plans involve heavy construction expenditures at peak cost levels," Schiller asserted.

Down and Up in a Hurry

The $40,000 rate decrease which the Fleming-Mason Rural Electric Cooperative, Flemingsburg, Ky., granted its members last year didn't benefit them very long. The co-op has just been granted a $49,000 rate increase by the Public Service Commission.

•

Union Contract Keeps Older Workers on Job

A clause in a union contract which prohibits discharge because of old age also prevents the compulsory retirement of an employee under an existing pension plan. But the employee may retire voluntarily.

This is the view of Common Pleas Judge A. V. Baumann of Fremont, Ohio, who has enjoined General Electric Co from retiring male employees over 65 and female employees over 60 at its electric vacuum division at Fremont.

When the company issued retirement notices to 26 employees, the International Association of Machinists, an independent union, took the case to court.

•

Wants Utility Customer

Jackson Purchase Rural Electric Cooperative Corp is opposing the sale of power by the Kentucky Utilities Co to the Ashland Oil terminal in McCracken County. Reason: the co-op claims the terminal is in its territory. The co-op had ordered materials to build a substation to supply the terminal, after it had been approached by Ashland officials. Then it discovered KU already had a station there and was supplying power.

•

Anaconda President Dies

J. R. Hobbins, president of Anaconda Copper Mining Co since 1940, died Nov 14. He also had been an executive of Great Falls (Mont.) Power Co and Montana Power Co.

Ohio Edison Plans to Purchase OPS; Merged Utility Will Be 11th in Nation

OHIO EDISON CO will buy Ohio Public Service Co on or before Dec 23. Cities Service Co, which now owns a controlling interest in the latter utility, is required to dispose of those holdings under the Public Utility Holding Company Act.

Eventually the two companies will be merged into an integrated system. Together they serve 492,254 customers and thus would be the nation's eleventh largest operating electric utility.

Approval for the purchase has been requested from the Securities and Exchange Commission and the Ohio Public Utilities Commission. Ohio Edison will pay $35 million for Cities Service's 2 million shares of Ohio Public Service common. The holding company sold 1 million shares of OPS to the public earlier this year and was authorized by SEC to enter into private negotiation for the remainder.

To Issue New Common

Sale will be to underwriters for cash. Ohio Edison will reimburse the underwriters by publicly offering through them not more than 1,144,000 shares of new common, now authorized but not issued, with a maximum net realization of $35 million. The $8-par stock will be sold at a net price of not less than $29 a share. If proceeds are less than $35 million, Ohio Edison will pay the difference in cash.

Ohio Edison plans to make a similar offer to public holders of OPS stock. They will be offered Edison common stock and whatever cash is necessary to give them the equivalent of $17.50 a share. The contract is subject to Ohio Edison's ability to market or exchange its stock at a satisfactory price as well as to approval by the regulatory commissions.

Territories Adjoin

The acquisition is expected to result in sizeable operating economies. The territories served by the two utilities adjoin for a distance of more than 200 miles and their transmission systems are interconnected.

Ohio Public Service supplies electric light and power service to 172,154 customers in 332 Ohio communities, including Warren, Lorain, Mansfield, Marion, Elyria, Sandusky, Massillon, Alliance, Ashland, and Port Clinton. Its gross operating revenues for the 12 months ended Aug 31 were $30,847,000. Assets totaled $126,086,000. It has six steam power plants with more than 300,000 kw capacity, located near Bellaire, at Warren, Alliance, Lorain, Mansfield, and Marion.

Ohio Edison recently became an independent operating company following the breakup of the Commonwealth & Southern Corp system. It serves 320,100 customers in 353 communities in Ohio and Pennsylvania. The largest are Akron, Youngstown, Springfield, Barberton, Campbell, Salem, and Struthers, all in Ohio, and New Castle, Sharon, Farrell, and Greenville, in Pennsylvania.

Gross operating revenues of the Ohio Edison system for the 12 months ended Aug 31 were $47,450,000 and assets totaled $201,580,000. Six of its steam generating plants, located in Toronto, Akron, Lowellville (a suburb of Youngstown), and Springfield, O., and New Castle, Pa., have more than 500,000 kw capacity.

Together the two companies serve 685 communities. Combined gross operating revenues for the 12 months to Aug 31 were $78,297,000 and combined assets totaled $327,666,000.

FINANCIAL BRIEFS

American Power & Light Co's reorganization plan has been approved by a New York federal district court. AP&L will distribute all its assets except for certain subsidiaries in Washington and Oregon. Preferred shareholders will receive 82% and common stockholders 18% of the assets, which include the company's holdings in Florida Power & Light Co, Minnesota Power & Light Co, Montana Power Co, and Texas Utilities Co. Then AP&L's common and preferred shares will be reclassified into a single class of common stock, which is to be divided among its shareholders.

Stockholders of Nova Scotia Light & Power Co have approved issue of 10,000 shares of 4½% preferred at $100 each, to be offered to shareholders and then to the public. The company also is seeking Nova Scotia Public Utilities Board permission to issue $1.5 million worth of 3⅝% first mortgage bonds, to be sold through underwriters. Part of the proceeds will be used to buy $1.1 million of first mortgage bonds from Avon River Power Co, Windsor, N. S., a subsidiary.

Cincinnati Gas & Electric Co stockholders will be asked at a special meeting Dec 21 to authorize an additional 3.5 million shares of common stock. A new stock issue is planned early next year to provide funds for completing the company's $85-million construction program.

British Columbia Power Corp. Ltd. plans to sell an additional issue of 240,000 no-par Class A shares at $25.50.

A two-way application has been filed by South Carolina Electric & Gas Co with the Public Service Commission. The company seeks to liquidate and take over its wholly owned subsidiary, South Carolina Power Co, and then refund $22.2 million of its own outstanding 3⅝% and 3⅜% bonds under the terms of South Carolina Power's bond indenture.

General Electric Co will prepay on Dec 1 the final $25 million of its $50-million five-year bank loan negotiated in December, 1946, part of a $200-million financing program arranged by GE in connection with its postwar reconversion and expansion.

Two utility bond issues totaling $4.5 million have been approved by the voters of Fairbanks, Alaska. The City plans to build a municipal power plant and distribution system as well as other utilities.

Ottawa Light, Heat & Power Co, Ltd. has called all its outstanding 5% cumulative redeemable preferred shares for redemption Dec 31 at $103 plus accrued and unpaid dividends.

A $25-million Hydro Quebec bond issue, guaranteed by the provincial government, was "oversubscribed and sold a few minutes after it was announced" provincial officials reported.

Sale by Idaho Power Co of $12 million in 2¾% first mortgage bonds, due 1979, has been okayed by Federal Power Commission. Proceeds of the sale, to go to institutional investors, will be used for construction and improvement of facilities.

Kansas City Gas & Electric Co. Wichita, Kan., has asked Federal Power Commission to authorize issuance of $3 million in first mortgage bonds, due in 1979. Private sale to institutional buyers is planned.

Long Island Lighting Files New Plan for Consolidation with Subsidiaries

LONG ISLAND LIGHTING Co has filed an amended consolidation plan with Securities and Exchange Commission embodying changes demanded by the Commission early this month.

The plan provides for consolidation of Long Island with its two subsidiaries, Queens Borough Gas & Electric Co and Nassau & Suffolk Lighting Co, with the consolidated company to issue a new series of common stock as its sole capitalization.

Common Stockholders Object

Meanwhile a committee claiming to represent one third of Long Island Lighting's common stock announced plans to call a stockholders' meeting for election of directors. Its spokesmen declared the proposed recapitalization plan was "totally inadequate" and urged preparation of a new plan by new officers. A committee claiming to represent 53% of the company's outstanding preferred stock supported the plan tentatively okayed by SEC.

The amendments call for 3,149,696.6 common shares outstanding instead of the 2,417,377.4 of the original plan. Long Island's 7% preferred holders would get 10.4 shares of the new stock for each share held, while 9.2 shares would be exchanged for each 6% preferred share and six new common shares for each 100 of the old common. Distribution to stockholders in the subsidiaries would be on the basis of 5.42 new shares for each 6% preferred share of Queens Borough and 6.7 new common shares for each share of Nassau & Suffolk 7% preferred.

Preferred Stock Favored

Thus 76.98% of the new stock would go to Long Island Lighting's preferred stockholders, 5.71% to its common stockholders, 11.51% to Queens Borough stockholders, and 5.8% to Nassau & Suffolk stockholders.

Long Island preferred stockholders would realize more than 25% greater earnings than under the original plan, despite the cut in their participation from 83.94% to about 77%, because of the company's increased earning power since the earlier plan was filed. Queens Borough preferred holders would be 33% better off, and Nassau & Suffolk preferred stockholders' participation would be nearly doubled.

Common stockholders of Long Island reportedly had hoped for about 15% of the new common shares instead of the 5.7% allotted to them. However, under the plan the New York Public Service Commission approved June 18, 1948, the old common had been allowed no participation at all and the PSC had declared in 1946 that it was "entirely worthless."

SEC estimated that future earnings of the consolidated company would be about $3.5 million annually, not including the possible savings resulting from consolidation, which it estimated at $250,000 a year after taxes. Electric operating income was placed at $4,147,500, equivalent to a 6% return on the $69-million net original cost of the consolidated electric plant.

Consolidated Edison Co's proposal to acquire the Long Island utility system will be delayed until SEC has finally approved the consolidation. Con Ed proposes to offer $28 million of 3% convertible 15-year debentures for the entire common stock of the consolidated utility. At present market prices that would be equivalent to a price of $31,640,000.

SEC RULINGS

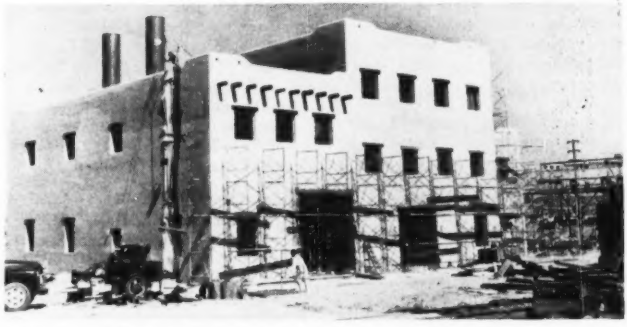
Northern States Power Co, Minneapolis, has received permission to make a public offering of a block of its common stock. The proposal involves the sale of 1,584,238 shares of no-par common stock, including 22,194 shares held in the treasury of the company. Common stockholders may purchase 1/6 share of new common for each share held Nov 17, with the privilege of subscribing to additional shares subject to allotment. Employees of the company and its subsidiaries will be entitled to purchase not more than 150 shares each from the unsubscribed shares. The balance, together with shares which may be acquired in connection with the company's stablization activities, will be offered at competitive bidding. Subscription price will be between $9.75 and $11 a share, with underwriting compensation not to exceed 50¢ a share. Proceeds will be applied to the company's construction program and to the payment of $15 million of short-term construction borrowings (Release No. 9434).

Malden Electric Co, Malden, Mass., has been authorized to borrow $500,000 from four banks on its 2% six-month notes and to use the funds to pay for construction expenditures during the remainder of 1949 or to reimburse its treasury for past expenditures (Release No. 9463).

Wisconsin River Power Co, Wisconsin Rapids, has received permission to issue and sell $1.5 million of first mortgage bonds 3% Series due 1977 to John Hancock Mutual Life Insurance Co at a price of 100.94% of principal. The company's request for exemption from competitive bidding was granted (Release No. 9458).

Fourteen New England Electric System subsidiaries have been granted permission for bank borrowings aggregating $3,150,000. They will use the funds to reimburse their treasuries for construction expenditures or to meet such expenditures for October, 1949. The largest borrowings are by Worcester County Electric Co ($900,000) and New England Power Co ($800,000) (Release No. 9464).

Middle West Corp, Chicago, has received permission to transform its system service companies into independent service companies. The stock of Middle West Service Co, Illinois Stock Transfer Co, and Bureau of Safety and Insurance Trust Fund would be transferred to certain officers and executives of the service companies as a donation in lieu of severance allowances in the event the service companies were to be liquidated (Release No. 9472).



FIRST DELIVERY of power from initial 6,000-kva unit being installed in Santa Fe steam plant, Public Service Co of New Mexico, is scheduled for Nov. 1, less than 12 months after equipment orders were placed and land acquired. Three marine-type boilers identical to those used in DE vessels will supply two 6,000-kva turbine-generators at 400 psi, 750° F

Output Is Holding Firm; Little Change Last Week

Electric energy output held firm for the week ended Nov. 12.

The nation's light and power companies distributed 5,434,555,000 kwhr, only slightly less than the 5,434,924,000 kwhr distributed the week before. Output for the week ended Nov 12 was down 2.4% from that of the corresponding week last year, 5,570,767,000 kwhr. This relationship also has been relatively steady for the past month.

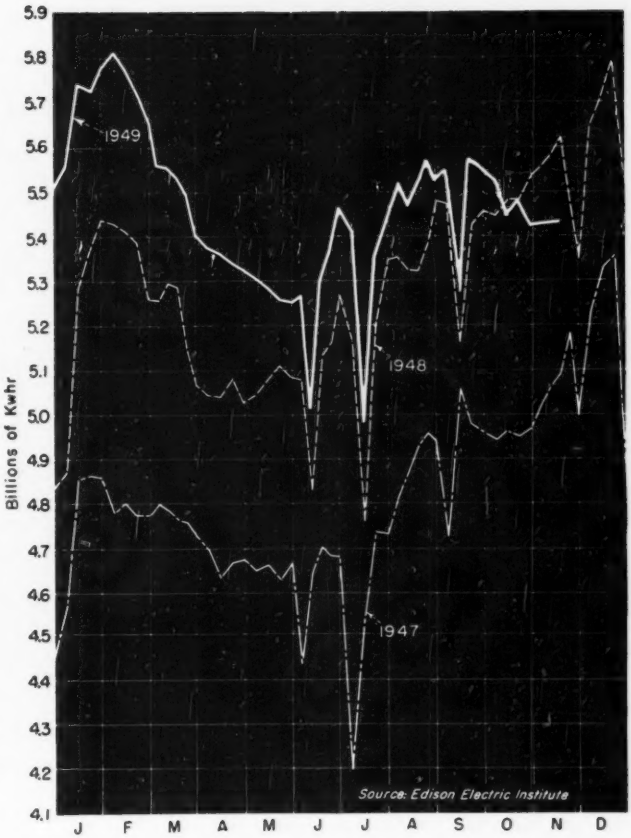
Sharpest drop from last year again was reported by the Central Industrial states, 9.7%. Only two other regions showed declines from the same period of 1948, the Mid-Atlantic area, 2.2%, and the Southeast, 2.1%. Output in the other regions rose as compared to last year. Largest percentage increase was in the South Central states, 7.4%.

Weekly Output, Millions Kwhr

1949		1948		1947	
Nov 12	5,435	Nov 13	5,571	Nov 15	5,084
Nov 5	5,435	Nov 6	5,564	Nov 8	5,057
Oct 29	5,433	Oct 30	5,555	Nov 1	5,009
Oct 22	5,430	Oct 23	5,539	Oct 25	4,964
Oct 15	5,481	Oct 16	5,482	Oct 18	4,946
Oct 8	5,450	Oct 9	5,482	Oct 11	4,958
Oct 1	5,521	Oct 2	5,449	Oct 4	4,935
Sept 24	5,556	Sept 25	5,461	Sept 27	4,956
Sept 17	5,579	Sept 18	5,426	Sept 20	4,977
Sept 10	5,258	Sept 11	5,166	Sept 13	5,053
Sept 3	5,544	Sept 4	5,470	Sept 6	4,721
Aug 27	5,523	Aug 28	5,478	Aug 30	4,940

Percent Change from Previous Year

	Nov 12	Nov 5	Oct 29
New England	+ 3.7	+ 2.9	+ 3.0
Mid-Atlantic	— 2.2	— 0.3	— 2.0
Central Industrial	— 9.7	— 9.2	— 9.8
West Central	+ 0.9	+ 2.4	+ 2.1
Southeast	— 2.1	— 1.5	— 3.4
South Central	+ 7.4	+ 3.9	+ 7.9
Rocky Mountain	+ 0.1	— 3.7	— 1.7
Pacific Coast	+ 2.0	+ 0.6	+ 4.9
Total United States	— 2.4	— 2.3	— 2.2



Cleveland Area Shorted

A short circuit in the Cleveland Electric Illuminating Co's Fowles Substation near Berea, Ohio, cut off power to a 90-sq-mi area on the morning of Nov 9. Service was restored to about 95% of the customers within 30 minutes. A routine switching operation was being conducted when a flashover caused the short. The break occurred in the main 132-kv line which connects the company's Avon and Ashtabula Plants.

•

Charter Oak Adds Unit

An additional 11,500-kw steam generating unit is being added to the Charter Oak Rural Electric Cooperative plant under construction near Temple, Tex. Addition of the second unit will give the plant a 23,000-kw capacity. Total cost will be about $3.5 million.

MEETINGS

Wisconsin Utilities Association
Joint Annual Convention, Electric and Gas Sections, Schroeder Hotel, Milwaukee, November 21-23.

American Society of Mechanical Engineers
Annual Meeting, Hotel Statler, New York, N. Y., November 28-December 2.

Exposition of Chemical Industries
Grand Central Palace, New York, N. Y., November 28-December 3.

American Society of Refrigerating Engineers
Annual Meeting, Edgewater Beach Hotel, Chicago, Ill., December 4-7.

American Society of Agricultural Engineers
Winter Meeting, Stevens Hotel, Chicago, Ill., December 19-21.

National Farm Electrification Conference
Stevens Hotel, Chicago, Ill., December 20-22.

Canadian Electrical Association
Annual Winter Conference, Chateau Frontenac, Quebec, January 16-18.

Plant Maintenance Show and Conference
Auditorium, Cleveland, Ohio, January 16-19.

Southwest Air Conditioning Exposition
Hall of Agriculture and the Poultry Building, Fair Park, Dallas, Tex., January 23-27.

American Society of Heating and Ventilating Engineers
Annual Meeting, Adolphus and Baker Hotels, Dallas, Tex., January 23-27.

American Institute of Electrical Engineers
Winter General Meeting, Hotel Statler, New York, N. Y., January 30-February 3.

•

Workers Reject IBEW

The International Brotherhood of Electrical Workers, AFL, has been rejected as bargaining agent by workers in Oklahoma Gas & Electric Co's outside transmission and distribution departments, including the general repair shop. Vote was 465 to 130.

•

Illinois Utility to Add Unit

A 65,000-kw addition to the Hutsonville Station has been authorized by Central Illinois Public Service Co. When completed in 1952, the station will have a capacity of 115,000 kw.

WASHINGTON COMMENT

WILLIAM B. WHICHARD

RESIGNATION OF Julius A. Krug as Secretary of Interior removes from the Truman Administration one of the last surviving "bright young men" of Franklin D. Roosevelt's New Deal. Only two other members of the then youthful group which once dominated the Washington scene remain in top government jobs. They are Atomic Energy Commission Chairman David Lilienthal and State Secretary Dean Acheson.

Krug, a comparative late comer to the ranks of this coterie, never attained the political prominence of some of its members. But as the last and most successful chairman of the War Production Board he set a mark for administrative ability second to none. This record made him an obvious choice for the first big peacetime job available in Washington.

As Secretary of Interior, however, Krug somehow never measured up to the level of performance expected of him as a result of his WPB achievements. It was inevitable that he would not. As Interior Secretary he had neither the wartime authority nor the brilliant staff support he enjoyed at WPB. He obviously was hamstrung by political considerations which would have blocked any changes he might otherwise have made in Interior policy or organization.

Indeed, the likeliest explanation of his decision to resign is that he finally became sick and tired of Washington politics. Ever since he went into Interior in March, 1946, Krug has been subject to oversize doses of what is more or less politely termed in Washington as "sniping." Most glaring example of this was the constantly recurring rumor, often from Interior sources, that he was quitting. Each time the rumor appeared it came complete with plausible explanations. These included reported Truman-Krug rows over policy and politics, a rumored break in the Secretary's health, alleged offers of plushy jobs in private industry. By design or otherwise, they created within Interior an atmosphere of uncertainty which, in turn, encouraged indecision and bickering.

His replacement by Undersecretary Chapman is in line with other Truman promotions of career government servants, Postmaster General Donaldson among them. It also is in line with the President's penchant for rewarding loyal supporters with a flair for snaring votes. Chapman, like Labor Secretary Tobin and Agriculture Secretary Brannan, worked hard and effectively for Truman in the 1948 election campaign.

On federal power policy, Chapman is likely to stand just about where Krug did. If anything, he is perhaps a more ardent advocate of federal power expansion than Krug. On the other hand, he's a more practical politician. This might mean that, while endorsing Administration proposals for creation of new valley authorities, for example, Chapman might prove more sympathetic to local sentiment in the areas involved. Basically, this would effect no change in Interior policy—Chapman can be expected to go along with the Administration on policy. But he might be inclined to persuade voters, rather than attempt to ram such policies down their throats willy-nilly. And he also may keep the Administration better posted on local sentiment, especially in the West, where his contacts are best.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Weather changes are considered to result from variations in solar flares on the theory that the radiated energy absorbed by the atmosphere varies.

Concrete spalling due to freezing of absorbed water may be attributable to (1) poorly graded aggregates, (2) improperly proportioned mixes, (3) excess water, (4) insufficient mixing, (5) separation of constituents, (6) over-manipulation, (7) poor curing or protection.

Interfacial tension test for insulating oil is coming to be rated among the five most important tests, if not the most significant single test. Good oil should measure 18 to 45 dynes per cm.

Gaskets containing alkyd and maleic resins, polystyrene, natural and synthetic rubbers and many esters should preferably not be applied as replacements in transformers filled with askarel.

Gas pressure will be established and accumulated if the oil in a transformer is decomposed by arc or heat from the following experienced causes; poor contacts, flash-over or creepage, puncture of insulation, corona, turn-to-turn shorts, defective core, poor oil circulation or level, admission of air.

Interconnections of 400 kv are expected to embrace all Western Europe in 20 years. By that time the 300-kv ring proposed for the British Isles would also be tied in.

Flood control works are expensive and of little value unless precipitation and runoff can be forecast with accuracy. The cost-to-benefit ratio of the information is far higher than for the floodworks investment.

Boiler manufacturers are reported ready to build furnaces designed for 1.6 billion Btu per hr heat release; the turbines could be 180 to 190 Mw.

Potheads—even the best designed and made—can foul if poorly filled and installed.

READY TO WELCOME GUESTS at outer door of Springdale station is Harold W. Lessig, test engineer, one of the tour hosts

Plant Tours Promote Free Enterprise

Carefully organized visits to modern generating stations are effective in giving to leaders of thought more accurate, and thus more favorable, impressions of the power company and the industry in general

HAROLD S. METCALFE,
Director of Public Relations
West Penn Power Co, Pittsburgh, Pa

PLANT VISITS can be employed strategically to mould or change the opinions of influence groups and thought leaders in a community. This is proved by the experience of West Penn Power Co in a series of tours through its Springdale Station for educators and clergymen.

West Penn's power stations like those of other utilities and the plants of many manufacturing concerns have long been open to visitors. Except during the war years, a small but steady stream of high school and college science classes, service clubs and other interested groups have toured our stations — particularly Springdale and the Lake Lynn hydro station—to be impressed by the vastness of the buildings and the huge, complicated machinery required to produce electricity.

However, the very design and nature of a steam-electric generating station makes it very difficult to pilot large groups of the public through a plant and send them home aglow with new knowledge of the company, its operations and its product. The heat, the noise, the mass of complicated equipment, the lack of visible motion and end result, the need for detailed explanations of highly technical processes are factors which work against the average generating station as a

1 **GIRL EMPLOYEES** of the station greet guests, stow wraps, pin on badges and occasionally wait on table at luncheon

2 **TOUR HOST,** William Thompson (pointing) gives a standardized explanation of equipment, not by rote but in his own words

Welcomed, shown around and fed, visitors are

showplace for the public-at-large.

The problems then, were these. First how to utilize the good points of a power station tour so as to arouse and maintain the interest of at least representative customers. Second, how to select groups of customers who were sufficiently intelligent and vocal to say a good word in their local communities for the power company, the electric industry and the free enterprise system within which it operates.

A clue to the latter problem appeared in April, 1947, when Opinion Research Corp issued a Public Opinion Index Report on "Industry and the Social Science Teacher." High school and college instructors in civics, political science, problems of democracy, sociology, history and geology were considered an especially important educational group because of the influence they bring to bear on the economic, social, and political thinking of youth. These teachers can help materially to hasten or to stem the tide towards Socialism. If convinced of the merits of the operations and service of their local electric company and, if willing to accept it as typical of the industry of which it is a part, these teachers can be extremely helpful in the cause of free enterprise. When the leverage of their beliefs is reflected in the minds and opinions of those who are under their intellectual guidance, this help is greatly multiplied.

The Public Opinion Index revealed that basically the majority of social science teachers were opposed to government ownership of business. Ideologically, they stood on center or to the right of center. But teachers did favor government intervention in business and those measures of social legislation where wage rates, wage stabilization, full employment and support of minimum farm prices were involved. It is significant to the electric utilities that *only 50% were opposed to* federal ownership of the electric companies.

The teachers surveyed indicated that they had plenty of technological information about industry, its processes and products. However, they knew very little about the social attitudes of industry or what many companies were actually doing for employee welfare and for community, area, and national well-being.

Two-thirds of the teachers surveyed for the Index said that businesses should try to explain their problems

How West Penn Power Co Organized Plant

1. Verbal invitations are tendered to prospective visitors by local representatives of company. Acceptances are reported to central office from where

2. Director of public relations sends letter to each future guest outlining the schedule of the visit in a general way, and expressing pleasure that the invitation has been accepted. The prospective visitor is asked to fill in and return a form containing

3. Several questions devised to elicit opinions concerning the company and the industry previous to the plant visit. The form also includes space for questions the visitor may want to ask. A few days after the letter a

4. Booklet describing the station is mailed to give the visitor some advance information on what he will see.

5. Visitors are welcomed on arrival at the station by girl employees serving as hostesses and by engineers and other personnel who will act as tour guides. They greet and introduce the visitors, pinning on them identification badges, previously prepared. Each guest is given a mimeographed program and itinerary stapled inside a printed cover.

6. Program begins in station auditorium where director of public relations explains the "get acquainted" nature of the affair and presents the

7. Plant superintendent who welcomes the guests and introduces the

8. Plant efficiency engineer who briefly explains the coal-to-electricity cycle and assigns the guests to their car hosts.

9. Guests are given group identification cards to wear in their pockets. The reverse of this card is a registration form.

3 **FEEDING THE BODY** as well as the mind, guests enjoy their luncheon, usually catered by ladies of a neighboring church

4 **WHERE THE MONEY COMES FROM** and what it goes for is explained by W. H. Swinney, vice-president and controller

informed of the facts of power company life

and operations with the same skill that they described their products and manufacturing methods.

This April, 1947, Index and public opinion surveys made specifically for the electric companies* indicated that significant percentages of school teachers tend to hold erroneous or unfavorable opinions on many points affecting the electric utility business, such as those relating to profits, Federal power projects, and multiple-purpose dams, for example.

In several case studies where industrial companies arranged special plant tours for teachers and followed these by seminars of panel discussions, with the opportunity for questions and open discussion, marked changes in attitudes resulted, with a consequent improvement in the public relations of those companies concerned.

With this knowledge at hand, West Penn's management approved a program of educational visits to Springdale power stations, with the hope that it would (1) Create a better awareness of the problems of the company and of the electric utility industry; (2) increase appreciation of the value of electric service; (3) favorably change attitudes that might be having a negative influence on the thinking of the youth of the area served, and (4) therefore enhance West Penn's public relations in the local communities served.

Preliminary arrangements were made in August 1947 for a pilot tour with the Springdale power station staff and the operating department in the company's northern division cooperating. A five-hour program was outlined to include introductions and a tour of the station in the forenoon, a catered luncheon in the station at noon, and a panel discussion of West Penn operations, led by top company executives, in the early afternoon to be followed by a question period.

Invitations were to be extended personally to the social science teachers in the high schools and colleges located within the northern division. In addition, teachers of the physical sciences and in some cases home economics and agricultural vocational instructors were to be included as a public relations gesture. District office personnel with the help of some sales people were assigned the task of extending these personal invitations to

* "The Public Looks at the Electric Companies"—biennial surveys in 1943, 1945, 1947 and 1949 by Opinion Research Corporation.

Visit Operations From Start To Finish

10. Groups of 7 or 8 are conducted through the stations on 3 or 4 min headway.

11. During inspection tour luncheon tables are set up in auditorium.

12. Luncheon is served when tour is finished and guests remain at tables for a

13. 45-minute panel discussion of company and its operations with director of public relations as moderator. Company top executives give 10-min talks on (a) power generation and transmission; (b) operating and sales policies and practices; (c) the personality of the company, personnel, employee relations and benefits etc; (d) the financial picture of the company. Following the panel discussion is a

14. 45-minute question-and-answer period. Questions sent in in advance are answered with prepared statements. Those from the floor are replied to by qualified panel members or by informed employees called upon by the moderator.

15. At end of program, each guest is given an envelope containing a current issue of the West Penn employee magazine, employee handbook, a memorial-scholarship announcement, annual report to employees, and other material. In a few days

16. Director of public relations writes to guests enclosing a second questionnaire which includes 3 questions asked in the previous one. Comparison of pre- and post-visit replies indicates changes in attitudes. (See tabulation of replies on another page.) Finally, each guest is sent a

17. Mimeographed booklet containing the four panel presentations and a transcript of major questions and answers.

ALL ALONG, from invitation to the end of his visit, the guest is given informative and guidance material

the teachers. Thus a series of valuable contacts was essential to the program, contacts in a "neglected area" of public relations activities.

In securing teachers' names from school superintendents and principals, it soon became evident that these school authorities desired very much to visit the station themselves. Accordingly, plans for the pilot tour were changed to provide a meeting exclusively for county and high school superintendents and principals and college instructors.

This tour was held November 8, 1947. The experience was extremely refreshing; it was received with enthusiasm both by the guests and by company representatives and was obviously a success. However, it indicated to those responsible for the program the need for many changes in approach and in the handling of details, and for developing sufficient interpretive aids to supplement sound by sight. In addition, it was obvious that some method would have to be devised for discovering if any attitudes were being changed.

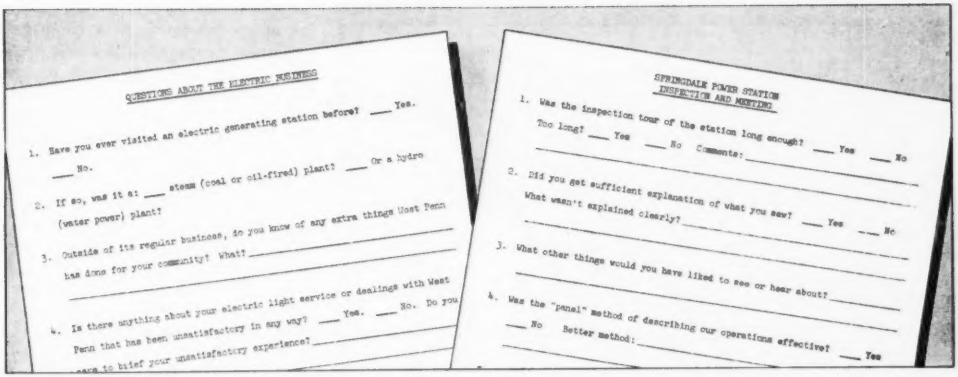
Conferences with all of the company personnel involved followed this test tour and a carefully detailed program for handling later tours was evolved. This has been followed with only the minor variations and improvements that seemed necessary in the eight succeeding tours for educators which were conducted in 1948, and is outlined in the accompanying sequence of plant visit operations.

At nine visits during 1947 and 1948, 393 school people were guests at Springdale. This number represented a little better than half of the total invited. All school visits were of necessity scheduled on Saturdays, that being the only reasonably free day for educators.

The frank admissions of many educators that they had held wrong ideas about West Penn and the electric light and power industry were revealing. Similarly, the indications of increased recognition of West Penn as a sincere citizen of the local community was heartening. All this brought up the question—if a group as influential as educators can be stimulated to become a force working for the company's better public relations, what other groups of thought leaders should be similarly cultivated?

The clergy and the newspaper editors immediately suggested themselves as logical groups for station tours. Because editors had recently been invited to the opening of the new Mitchell power station, and because the clergy were more numerous, a series of five visits for the ministers, priests, rabbis and allied religious workers in the area served was held in May and June 1949.

The same procedure and program was followed with the clergy as with school people, with only minor adjustments. Attendance totaled 258—considerably less than half of those invited. Religious meetings and the emergencies peculiar to the profession made it difficult to predict attendance even when checks were made by company personnel a day or two



QUESTIONS ABOUT THE ELECTRIC MEETING

1. Have you ever visited an electric generating station before? ___ Yes. ___ No.
2. If so, was it a: ___ steam (coal or oil-fired) plant? ___ Or a hydro (water power) plant?
3. Outside of its regular business, do you know of any extra things West Penn has done for your community? What?
4. Is there anything about your electric light service or dealings with West Penn that has been unsatisfactory in any way? ___ Yes. ___ No. Do you care to brief your unsatisfactory experience?

SPRINGDALE POWER STATION
INSPECTION AND MEETING

1. Was the inspection tour of the station long enough? ___ Yes ___ No
   Too long? ___ Yes ___ No Comments:
2. Did you get sufficient explanation of what you saw? ___ Yes ___ No
   What wasn't explained clearly?
3. What other things would you have liked to see or hear about?
4. Was the "panel" method of describing our operations effective? ___ Yes ___ No Better method:

BEFORE AND AFTER plant visits, guests are asked to answer questions on their opinions of the company and the industry

before. Tuesdays, incidentally, were considered the best visiting days by the clergymen themselves.

Reactions of religious leaders to the tour program paralleled those of the educational group, although the clergy in general showed a somewhat clearer knowledge and understanding of the broader problems of industry and the current socialistic trend. This group was also far more vocal in expressing their opinions and convictions. Their attitudes and reactions were similar in a great many respects to those reflected in the recently-issued Public Opinion Index, "Business and the Clergy."*

With the evidence we now have of significant changes in attitudes on the part of these two influence groups, we can be reasonably assured that there is an increased friendliness toward the company and West Penn personnel as a result of these tours. More concretely, the statistical summaries of answers to the test questions included in the pre- and post-visit questionnaires show sharp trends in favor of the utility industry and the company after the visits.

In studying the accompanying tabulation of answers, it should be kept in mind that the questions themselves are not necessarily of great significance. They are tested similar questions asked in the public opinion survey, "The Public Looks at the Electric Companies"—1947. These three questions were selected because of the naturalness with which they could be worked into the questionnaires.

Thus these plant tours have become a very valuable aid in developing better public relations for West Penn Power Co specifically and the electric light and power industry in general. In the first place, they have brought the company with its key personnel into closer contact with two important groups—thus far—that previously received too little attention. Division and district personnel have grown more conscious than ever before of the opportunities for building sincere friendships for the company in local communities. Several opportunities have already developed to send information to both educators and clergy on questions which were were raised at the plant visits.

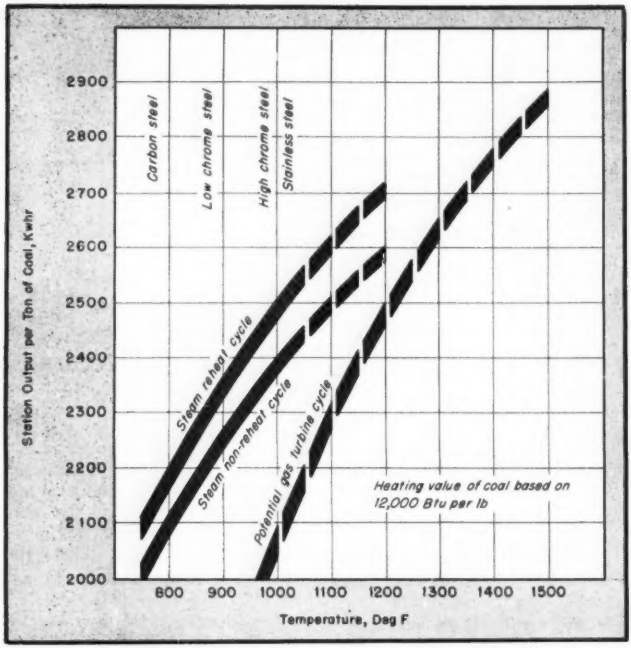
In the second place, the tour programs are now a tested means of changing erroneous opinions previously held and of creating favorable attitudes.

Finally, since so much of the work of both educators and clergy is with youth, the effective guidance of an informed leadership today on the potential leaders of tomorrow is bound to be for good.

* The Public Opinion Index for Industry, "Business and the Clergy"—Opinion Research Corporation, June 1949.

Changes in Opinions Resulting from Plant Visits

Questions	Opinions	Educators				Clergy				All Replies			
		Before		After		Before		After		Before		After	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
On the question as to whether the same dam can provide real flood control and also dependable electric power, what is your impression?	It can	119	37	49	23	55	31	28	24	174	35	77	23
	It cannot	113	36	125	58	35	20	61	52	148	36	186	56
	No opinion	85	27	42	19	87	49	28	24	172	35	70	21
Which would probably give you the lowest electric rates, a private company, a city or town, or the federal government?	Private company	157	53	179	83	117	74	101	85	274	60	280	84
	City or town	33	11	8	4	17	11	5	4	50	11	13	4
	Federal government	98	33	24	11	23	15	13	11	121	27	37	11
	No opinion	8	3	4	2	...	...	...	...	8	2	4	1
Is it your impression that West Penn makes too much profit?	Too much	18	6	3	1	3	2	3	2	21	4	6	2
	Reasonable	192	59	194	88	83	50	103	82	275	56	297	85
	No opinion	113	35	25	11	79	48	20	16	200	40	45	13



RELATIVE PERFORMANCE of electric utility power station cycles. The gas turbine promises triple incremental gain in the thermal efficiency with increasing temperature

Trend of Generation For The Decade Ahead

JOHN R. CARLSON, Application Engineering Manager, Steam Division
Westinghouse Electric Corp, South Philadelphia, Pa.

DURING the ten-year period immediately ahead should you reckon with the possibility of atomic piles furnishing heat for the great majority of steam driven turbines?

Our considered answer to that question is NO . . . even, though we know the next decade will bring a few demonstrator installations using atomic piles. Conversion of heat energy into electrical energy will still be by steam turbines.

Will modification of the gas turbine for power plant use provide units generally applicable by you during the next 10 years?

Our considered answer to that question is also NO. We say that advisedly, because right now we are deeply involved in the development of five gas turbines. Our first one is a 2,000-hp unit which has been on test since September of 1946. The turbine has operated a total of 1,450 hours. It has been started 700 times and has been subjected to several thousand load cycles. It has been modified to drive a single stage centrifugal gas booster in a gas line pumping station.

To develop a high efficiency gas turbine power plant in smaller sizes, we are collaborating with the Lima Hamilton Corporation for our second project and have built a gas turbine generator set. This turbine takes hot high pressure gases from two free-piston gas generators which replace the multi-stage air compressor and the combustors. This unit is expected to go into test operation early this year. It is designed for a gas pressure of 110 psi and 1,350 F at the turbine inlet.

We are building two 2,00-hp gas turbine power plants for a 4,000-hp demonstrator locomotive which will be on the rails this year. A 3,000-hp gas-turbine-powered locomotive for the Pennsylvania Railroad will have six free piston gas generators feeding a single turbine geared to electric generators.

Our fifth gas turbine project is the design and development of a closed-cycle gas turbine the results of which should have considerable bearing on the future of the closed cycle as applied to gas turbines.

We are not now planning gas turbines in sizes usually thought of in the central station industry where the average size unit purchased is about 45,000 kw. Right now we are thinking of units of 5,000, 10,000 or 15,000-kw rating.

Improved Steam Plants

Is improved design of steam plants for operation at temperatures upwards of 1,050 F and with correspondingly elevated pressures a matter that should figure importantly in your expansion planning for the next decade? Definitely YES.

Here is the reason:

Simply because the high temperature steam turbines do a better and more economical job than any other prime mover.

It is reasonable to believe that in the near future we can go to 1,100 F and later possibly even 1,150 F which can increase output to about 2,550 kwhr per ton of coal.

However, we propose to pause at the 1,050 F plateau of operating temperature long enough to gain substantial experience background for the next step forward. In other words, we want to be sure that we do not sacrifice continuity of service in our eagerness to obtain the utmost in thermal economy.

Adapted from paper at recent Savannah meeting of the Southeastern Electric Exchange Engineering and Operation Section

The reheat cycle gives a further gain in kwhr output. For example, at 1,000 F the non-reheat cycle provides 2,400 kwhr per ton of coal. But the reheat cycle at the same temperature produces 2,510 kwhr per ton of coal or a gain of about 4½%.

Without question the gain in thermal efficiency with increasing temperatures and pressures of the steam cycle is leveling off. On the other hand, the gas turbine shows about three times the incremental gain in thermal efficiency with increasing temperatures. But we have not reached the limit of the steam plant. It still does a better job than the infant gas turbine today.

Outdoor Units

A 35,000-kw turbine generator unit has been built for a Texas utility which is arranged for partial outdoor service. A steel enclosure is provided for the exciter and for the turbine. The generator is exposed to the weather.

We have built two 60,000-kw turbine generator units which are now being installed in the new plant building for another Texas utility. The turbine, generator and exciter will be completely exposed to the weather. Such weather proofing as is necessary at glands, steam chests, throttle valves will be provided by a close fitting weatherproof jacket. Quick opening doors and removable panels provide the needed accessibility. This plant will provide a means of comparing the costs of outdoor steam plants with the conventional indoor type.

Large Generators

Just 20 years ago we undertook the job of building the first 15,000-kw, 18,750-kva, 80% power factor, 3,600-rpm generator. These generators were 50% larger than anything heretofore undertaken. The first of these five 15,000-kw turbine generator units was completely designed, manufactured and shipped in nine months. Since then generators have grown in progressive steps to 50,000 kw in 1936, 65,000 kw in 1940 and 80,000 kw in 1945. This development of generators has just culminated in a record breaking unit of 110,000 kw, 85% power factor, 129,410 kva just ordered by the Union Electric Co of St. Louis. To permit the use of a single winding generator a terminal voltage of 16,500 was selected.

Customer	Kw	Power Factor	SCR	Kva	Hydrogen Pressure, lb
Public Service Electric & Gas	95,000	0.85	0.92	111,765	0.5
Alabama Power Co	100,000	0.9	0.9	111,111	0.5
Union Electric Co	110,000	0.85	0.8	129,410	0.5

We are currently building three large 3,600-rpm hydrogen cooled generators as follows:

The first and third generators in the tabulation are being designed for a hydrogen operating pressure of 30 lb which will permit a 25% increase in rating.

Such large generators are possible because we are now able to secure large chrome nickel molybdenum vanadium alloy steel forgings which have a yield strength of 95,000 psi instead of 85,000 psi as now used without sacrifice in ductility or hardness properties.

Although generator rotors do not operate at high temperatures like turbine rotors it is important that they be made of sound material so that they will run true and smoothly. To insure such sound forgings we have added to our customary methods of testing a new method which depends upon supersonic sound waves.

Supersonic sound waves are passed through the rotor and are reflected back to produce an image on a reflectoscope. Flaws such as cracks or slag inclusions reflect sound waves in a different manner and they show up on the reflectoscope screen in a manner similar to radar detecting an air plane in the sky.

Exciters

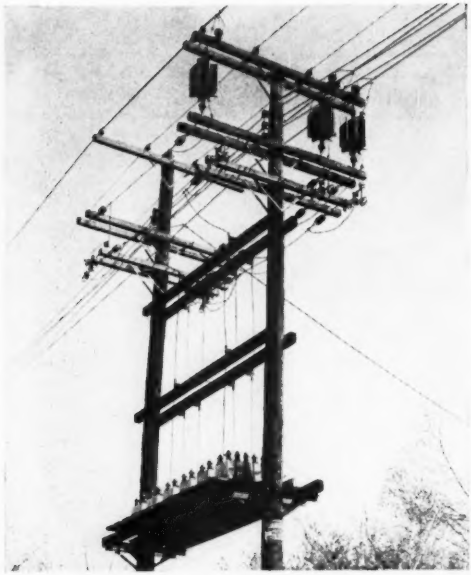
More than a dozen turbine generator units using rototrol pilot exciters are on order. The rototrol system has the advantages of a regulator without moving parts or contactors. The advantages of this system are just beginning to be appreciated and its use will increase at a rapid rate.

Of the larger size 3,600-rpm exciters we have orders for eleven of the 265-kw size and seven with a rating of 280 kw. The first of the 265-kw exciters has been in operation for almost ten years and the first of the 280-kw size went into service the fall of 1948. Union Electric's 110,000-kw generator will be excited by a 350-kw, 375-v, 600-rpm direct connected exciter. The use of a 50% higher voltage decreases the field current to two-thirds for the same kilowatt rating thus resulting in a short commutator, fewer brushes and less heat loss at the commutator surface. The higher voltage means that only two-thirds as many brushes are required on the generator collector rings. The temperature is lower and brushes last longer.

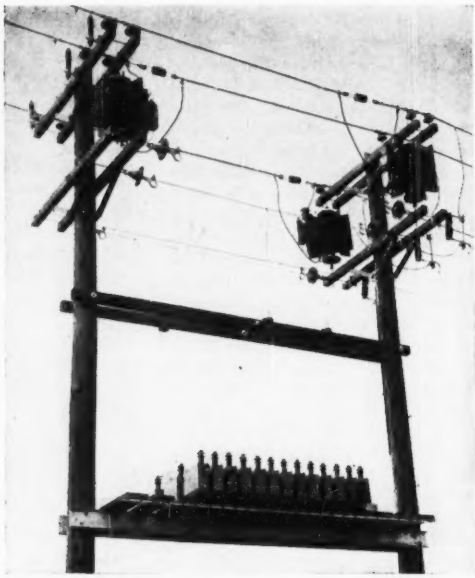
The first generator to operate with excitation voltage of 375 was placed into service last fall. This unit has a rating of 81,250 kva, and it is provided with a 265-kw, 375-v direct connected exciter.

In our considered opinion at Westinghouse the next decade will confirm these predictions:

1. Atomic energy will not have become a source for bulk generation of power.
2. Gas turbines will not have become a source for bulk generation of power.
3. The steam turbine will continue to be a source for bulk generation of power.
4. Higher operating steam temperatures can and will be achieved for steam power plants.
5. Steam reheat cycles will become more commonly used as a further means for improving plant efficiency.
6. Turbine generator units operating at 3,600 rpm can now be built in large enough kilowatt size to suit the requirements of even the largest utilities.
7. For the larger generators the terminal voltage will be raised above the now commonly used values at 13,800 or 14,400 v.
8. To make the excitation job easier exciter voltages of the larger 3,600 rpm units will rise to 375 v.



THREE WAVE FILTERS protect carrier voltage from a 975-kvar capacitor bank on an overhead feeder, remote from substation



400-AMP WAVE FILTERS, "L" section type, and 12-kv, 975-kva capacitor bank at a 4,000-kva mercury-arc rectifier installation

Wave Filters Protect Carrier Signals From Shunting Effect of Capacitors

High-voltage wave filters preserve carrier voltages and suppress undesired spurious voltages associated with carrier operation on distribution systems

W. A. RINGGER, Jr.
Senior Engineer, Standards Laboratory
Memphis Gas Light & Water Div
Memphis, Tenn.

IN THE OPERATION of the carrier current system, used on the Memphis electric power distribution system for the control of street lights, certain types of equipment interfere with the 3,000-c carrier signal that is superimposed on feeders at substations throughout the city.

Improper operation may be caused by insufficient carrier voltage on the feeder due to the carrier voltage being shunted by equipment such as a capacitor bank; or carrier receivers may be operated falsely by a spurious voltage that is impressed on a feeder by a piece of equipment such as a mercury arc rectifier.

Basically the problem is the same in either case. Power frequency currents must flow through to this connected equipment; yet the carrier system must not be influenced by the presence of the equipment that is on the system.

Solution to the problem on the Memphis distribution system has been the installation of high-voltage wave filters using various parallel and series resonant circuit combinations. The design and application of these filters is discussed in detail in the following paragraphs.

Parallel Resonant Circuit

Since carrier control frequencies are generally higher than power distribution frequencies, a parallel resonant circuit has been found to offer a solution to the basic problem. A parallel resonant circuit at resonance presents a very high impedance, while at frequencies below resonance, the circuit becomes inductive.

A coil and a capacitor are connected in parallel to form a parallel resonant circuit. As may be seen in Fig. 1 (b), when the quadrature component of the current in the inductive branch is equal to the quadrature component of the current in the capacitive branch, the line current is in phase with the line voltage. This establishes parallel resonance on the

condition of unity power factor and the line current is minimum under these conditions. At resonance the line current would be zero if it were not for the resistance of the coil designated by R. For a given line voltage, minimum in-phase line current means maximum impedance.

It can be seen in Fig 1 (a) that at frequencies below the resonant frequency, the current I_0 lags the voltage E, and consequently the current appears inductive.

In order to calculate values for the inductor and capacitor of the filter, the impedance looking into the parallel circuit is:

1. $$\overline{Z}_{LI} = \frac{\overline{Z}_L \cdot \overline{Z}_C}{\overline{Z}_L + \overline{Z}_C} = \frac{(R + j\,X_L)\,(-j\,X_C)}{R + j\,(X_L - X_C)}$$

2. $$\overline{Z}_{LI} = \frac{R X_C^2}{R^2 + (X_L - X_C)^2} + j\frac{(X_C^2 X_L - X_C X_L^2 - R^2 X_C)}{R^2 + (X_L - X_C)^2}$$

For unity power factor (resonance) the j term must become zero:

3. $$j\frac{(X_C^2 X_L - X_C X_L^2 - R^2 X_C)}{R^2 + (X_L - X_C)^2} = 0$$

The reactance of the coil should be very much greater than the coil resistance so that the above equation reduces to:

4. $$X_L = X_C$$

Equation (4) in terms of resonant frequency expands to:

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

Frequency is in cycles per second, inductance L is in henrys, and capacity C is in farads.

The "Q" of the circuit and consequently the shape of the resonance curve will be a function of the particular application as discussed in the following paragraphs.

Normal voltages at power frequencies developed across the parallel resonant circuit are small and hence insulation is no problem. Low voltage parallel resonant circuit tuning capacitors may be utilized with working voltages of the order of 500 v. Well designed parallel resonant circuits for system high-voltage lines can be expected to present a 300-c impedance of 200 to 1,200 ohms. The necessity for impedances larger than 400 to 500 ohms occurs only under conditions where several units (capacitor bank and wave filter combination) are used in parallel at one location. The 60-c impedance of the average high voltage wave filter will generally be less than an ohm. For example, the 400 amp units shown in an accompanying photograph have a 3,000-c impedance at about 500 ohms while the 60-c impedance is

$$Z = 0.3 + j0.42$$

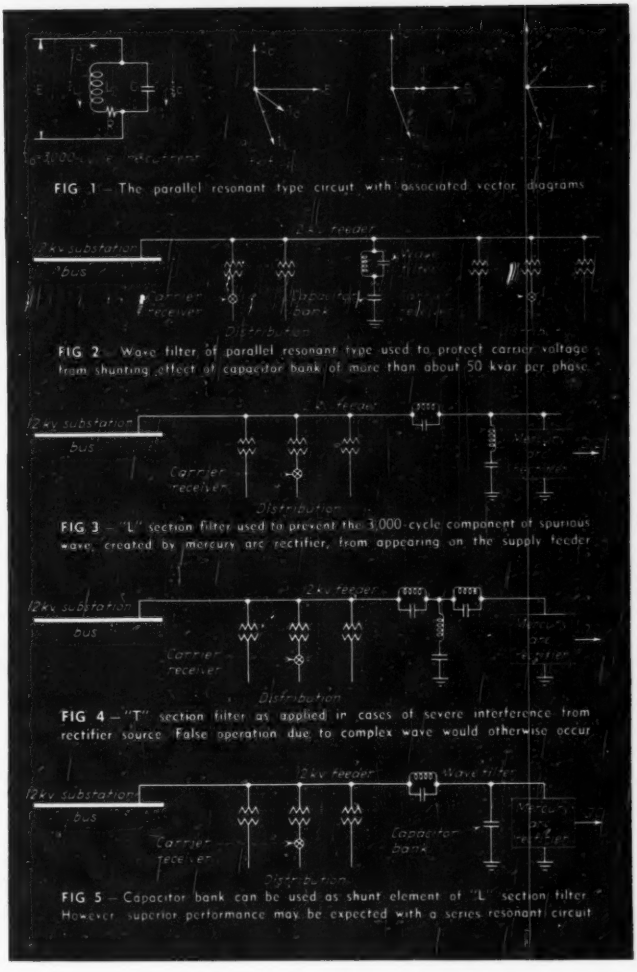


FIG 1 — The parallel resonant type circuit with associated vector diagrams

FIG 2 — Wave filter of parallel resonant type used to protect carrier voltage from shunting effect of capacitor bank of more than about 50 kvar per phase

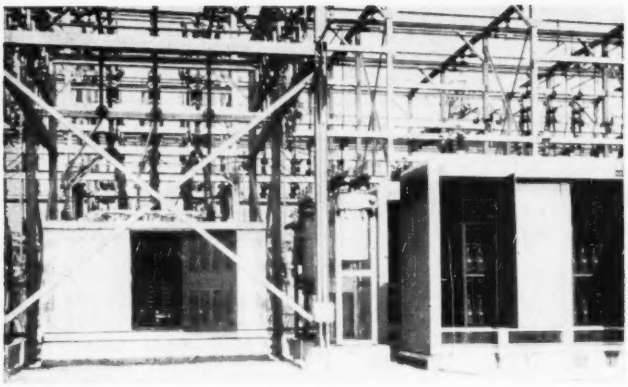
FIG 3 — "L" section filter used to prevent the 3,000-cycle component of spurious wave, created by mercury arc rectifier, from appearing on the supply feeder

FIG 4 — "T" section filter as applied in cases of severe interference from rectifier source. False operation due to complex wave would otherwise occur

FIG 5 — Capacitor bank can be used as shunt element of "L" section filter. However superior performance may be expected with a series resonant circuit

Capacitor Banks

A capacitor has an impedance at 3,000 c which is 1/50 of its impedance at 60-c power frequency. If the impedance of a bank of capacitors is small in comparison with the impedance of the feeder, there will be a shunting effect in the ratio of these two impedances. Generally a transmission line or overhead feeder will have a surge impedance in the order of 400 to 600 ohms. This will dictate the use of wave filters on banks of more than about 50 kvar per phase. The circuit for wave filter connection on a capacitor bank is shown in Fig 2. An accompanying picture shows a capacitor bank of 975 kvar, 325 kvar per phase, installed on an overhead feeder. This size bank of capacitors appears to the 3,000-c carrier current to be about 3-ohm reactance. Without wave filters there would be practically no



SUBSTATION CAPACITOR BANK with associated 12-kv wave filters. One of the cast-in-concrete inductances is shown in the metal housing through the open door at the left

carrier voltage at this point on the feeder. Wave filters rated at 500-ohms impedance at 3,000 c, for use on a 12-kv circuit, 7.2-kv line-to-ground and capable of handling 100 amp at 60 c, are visible in the same photograph. These wave filters provide adequate impedance to the 3,000-c current path through the capacitors. They are designed for pole top mounting.

A substation installation of a bank of 20,000 kvar of capacitance is also shown. On the left side of the photograph can be seen the cast-in-concrete inductance coil inclosed in a steel housing. The inductance of this unit is approximately 290 μh, and the capacitance used to tune, or resonate, this wave filter is approximately 10 μf. The circuit is tuned to frequency by taps at various turns on the inductance. This unit has a continuous rating of 950 amp.

On the Memphis system large wave filter units with current carrying capacity greater than 500 amp continuous are usually specifically designed for a particular application. These filters are generally furnished by the manufacturer of the capacitor bank with which they are utilized.

Most small wave filters, ie, less than 400 amp, are handled by stock units of 100 amp, 200 amp or 400 amp capacity as listed in the accompanying table. Complex filter circuits are made up of these stock sizes.

Series resonant circuits must carry only their own current and therefore are small in size. Naturally only one type of series unit is required for a given voltage.

Mercury-Arc Rectifiers

Small mercury arc rectifier installations of several hundred kilowatts when supplied by conservative bus energy do not emit appreciable spurious voltages. But larger rectifiers cause a spurious wave of complex nature to appear on the supply feeder, and often this spurious wave is of such voltage amplitude that it will appear on the bus of the substation supplying the feeder. This complex wave may embody a component in the frequency range of the carrier receiver. The carrier receiver has no way of distinguishing between the recurring component of the complex wave developed by the rectifier and the actual carrier signal. Naturally false operation to carrier equipment will be prevalent in this feeder area.

To suitably filter this component and at the same time maintain high carrier voltage level at this point may be accomplished by the use of an "L" section type of filter. Such an "L" section filter is composed of a parallel resonant circuit and a series resonant circuit connected as shown in Fig 3. A series circuit at resonance presents across its terminals a minimum impedance resistive in character. At frequencies below resonance the circuit becomes capacitive in reactance. To a 300-c component created by the rectifier the "L" section filter acts as a voltage divider in the ratio of the resonant impedance of the series circuit to the resonant impedance of the parallel circuit. The theoretical ratio is generally better than 500 to 1 in voltage reduction at the resonant frequency. In practice a spurious wave whose 3,000-c component has a peak value of greater than 2.0 v can be reduced to a value of less than 0.05 v—0.05 v being the usable lower limit of readibility of the available 3,000-c voltmeter.

A "T" section filter may be needed under severe conditions as in Fig 4.

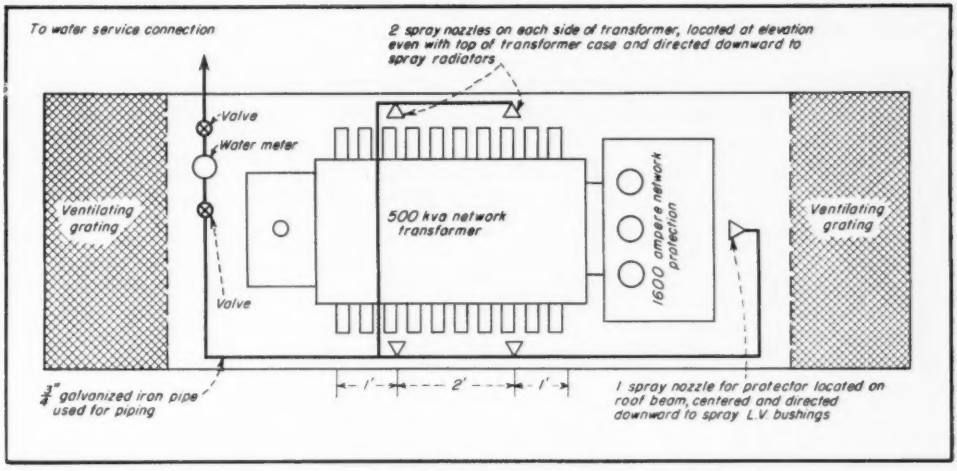
Because a capacitor bank presents a low impedance path for high frequencies, it can be used in place of the shunt element of a complex filter in rectifier interference elimination. Fig 5 illustrates this application. While the average small bank of capacitors which might be installed near a rectifier on a feeder may present no less than 5 ohms reactance at the carrier frequency, the reduction in spurious wave 3,000-c component may be found satisfactory in certain cases. Superior performance may be expected from the employment of a series resonant circuit as the shunt element.

A suitable wave filter installation for a large industrial rectifier of about 4,000 kva is pictured herewith. This "L" section wave filter renders adequate protection for the carrier receivers from the rectifier, and at the same time permits the capacitor bank to serve as a power factor correcting influence. The benefits of this dual application are accomplished by: (1) Providing wave filters which will carry the rectifier line current as well as capacitor current, and (2) locating the capacitor bank near the mercury arc rectifier.

Characteristics of Wave Filter Components

(Parallel circuit, 7,200-v phase-to-ground)

Current Rating	Construction	3000 Cycle Impedance	60 Cycle Impedance	Inductance, Henries	Capacitance, Microfarads
100 amp	Commercial	500 + j0	0.05 + j0.40	0.0011	2.0
200 amp	Transformer Shop	160 + j0	0.015 + j0.17	0.00046	6.35
400 amp	Commercial	500 + j0	0.03 + j0.40	0.0011	2.0


To water service connection
2 spray nozzles on each side of transformer, located at elevation even with top of transformer case and directed downward to spray radiators
Valve
Water meter
Valve
Ventilating grating
500 kva network transformer
1600 ampere network protection
Ventilating grating
¾" galvanized iron pipe used for piping
1'
2'
1'
1 spray nozzle for protector located on roof beam, centered and directed downward to spray L.V. bushings

COOLING INSTALLATIONS provide two nozzles on each side of transformer radiators and one on the network protector

Water Spray Cooling Of Network Transformers

Postpones need for 31 transformers, protectors, vaults and associated conduit and cables. Step originally taken as emergency operating measure now accepted for economic reasons

WATER SPRAY cooling of network transformers made it possible for Union Electric Co, Missouri, not only to carry this year's summer peak load but to postpone the installation of 31 transformers and associated protectors, vaults, conduit and cable on its St Louis underground system.

This was not the company's first experience with spray cooling of network transformers. Two years ago, in 1947, 14 vaults had been so equipped when it became apparent that loads were growing faster than equipment could be purchased and installed. The actual program of installations as worked out in 1947 and later is summarized in Table I.

Cost of water spray cooling installations, including all labor and material, averaged $300 each. Water cooling in St. Louis is operated about 100 days per year during the summer.

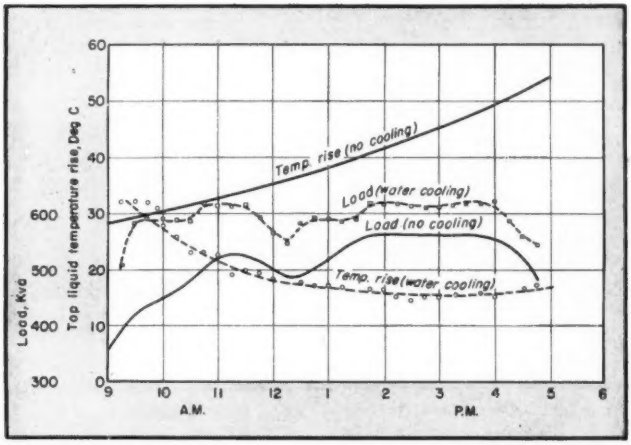
TABLE I—1947 Program of Water-Cooling Installations Downtown (St. Louis) Network (500-kva Units)

	1946	1947	1948	As of July 1, 1949	Est. as of Dec 31, 1949
No. Units Water Spray Cooled	0	14	14	32	73
No. Units in Service	69	92	129	142	154
No. Units required without water cooling					185

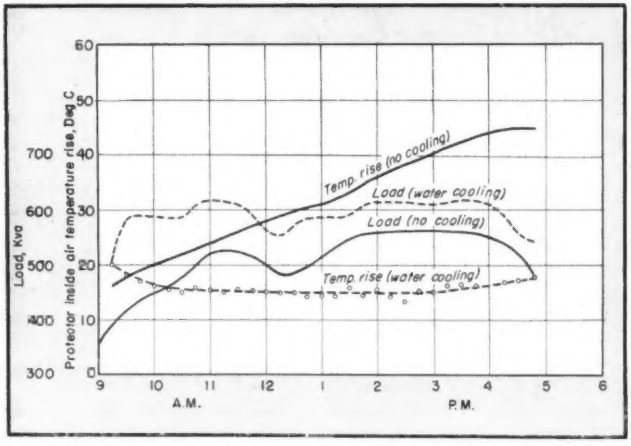
with a continuous flow of water during the 100-day period.

Consideration has been given to installation of automatic equipment to turn the water on during heavy load periods and off when it is not needed. So far, no installations of this type have been made. Manual control of water is not considered practical from an operating standpoint and so, installations made to date are operated continuously during the hot weather season.

Cooling installations consist of a standard ¾ in. tap to a city water main with a water meter located inside the vault and a valve on each side of the meter. The water is piped



TEMPERATURE RISE is reduced sharply by water spray cooling 500-kva network transformer. Test conditions were: with no cooling, average ambient air temperature 27.8 C; with cooling, average ambient air temperature 32.6 C; average water rate 7.15 gpm; water inlet temperature 24 C; water outlet temperature 27 C



AIR TEMPERATURE RISE inside protector is also reduced by cooling. Curves show test results on 1,600-amp protector. Test conditions were: no cooling, average ambient air temperature 27.8 C; with cooling, average ambient air temperature 32.6 C; average water rate 7.15 gpm; water inlet temperature 24 C; water outlet temperature 27 C

to the spray nozzles, four of which are directed on the transformer cooling radiators and one on the network protector as shown.

Spray nozzles installed are of a type used effectively in generator intercoolers and in air conditioning cooling towers. Their rating is 2.54 gpm at 40 psi.

Tests were made before the high summer loads developed and loading was accomplished by opening the protectors at several surrounding locations. On a 500-kva transformer, with no cooling and an average 8-hr load of 510 kva, or 102% of nameplate rating, top liquid Askarel temperature reached 84.5 C or a rise of 54 C over ambient (street air temperature). With water spray cooling at 7.15 gpm and an average 8-hr load of 592 kva, or 118% of nameplate rating, top liquid temperature reached 50 C or a rise of 17 C over street air ambient. Correcting these results to 100% load and to a hot summer day ambient of 38 C (100 F) the following comparison was made:

	Transformer Top Liquid Temp. Rise Deg C	Transformer Top Liquid Temp. Deg C
No cooling	52	90
With cooling	16	54

On this basis it was estimated that the transformer could carry 857 kva or 171% of rating for a normal load period on a summer day, using water spray cooling without exceeding a top liquid temperature of 85 C.

Protector capacities were also increased by spray cooling. With no cooling and an average 8-hr load of 510 kva or 85% of protector nameplate rating, inside air temperature reached 76 C or a rise of 45 C over street air ambient. With the water spray on, and an average 8-hr load of 592 kva, or 99% of nameplate rating inside air temperature reached 52 C or a rise of 19 C over street air ambient. Adjusting these results to 600 kva, 100% load, and to a hot summer day ambient of 38 C (100F), the following comparison was made:

	Protector Inside Air Temp. Rise Deg C	Protector Inside Air Temp. Deg C
No Cooling	62	100
With Cooling	19	57

It was therefore, estimated that, by using water spray cooling, the protector could carry 778 kva, or 130% of rating, for a normal load period on a hot summer day without exceeding an inside air temperature of 70 C. However, the uprating of the protector cannot be treated in the same manner as the transformer because of possible damage to the equipment such as the air circuit breaker, relays, current transformers, motor and other control components. The rating of the alloy main fuses is reduced with high protector temperatures. Network protectors are maximum rated devices and the selection of a protec-

tor having a 20% higher nameplate rating than that of its associated transformer is made for this reason.

Tests to determine bushing stud temperature with water spray cooling were not successful since some water was running over part of the thermometer. Stud temperature rise with no cooling on 100% load basis was 63 C or a total temperature of 101 C on a 38 C ambient.

With the following conditions established:

1. Temperature rises from the test data
2. 8-hr load period
3. 38 C (100 F) ambient
4. Transformer top liquid temperature limit of 85 C
5. Protector inside air temperature limit of 70 C
6. 2nd contingency load (when two of the primary network feeders are out of service) = 150% of normal load

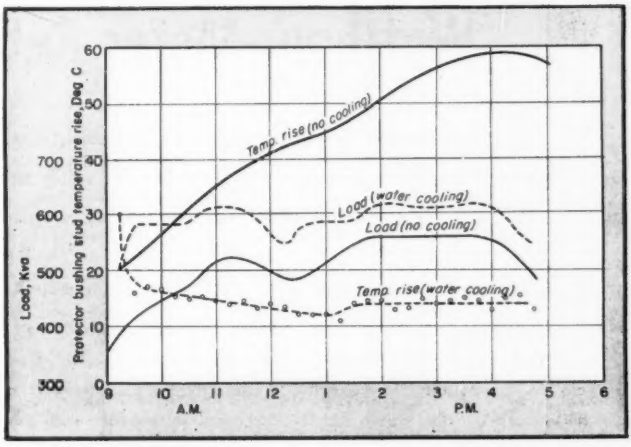
comparison of no cooling vs water cooling for a typical 500-kva transformer and its 1,600-amp (600 kva) protector shows load limits summarized in Table II.

From this it is seen that protector thermal ability is the limiting factor in this combination. Accordingly round-figure limits can be set for the normal load condition as given in Table III.

When normal loads exceed 300 kva or 60% of transformer nameplate, consideration should be given to either system reinforcements or to cooling to prevent overheating damage during 2nd contingency operation in the summer.

Average temperature rise of cooling water of 3 C, which was realized during the test represents a heat loss removal of 5.6 kw. Although some cooling was obtained by vaporization, the quantity of water used and the very complete wetting of the transformer and protector gives cooling for the most part due to direct temperature rise of the water. Transformer and protector losses for the test of 592 average kva, 118% load, average 8.5 kw. Therefore, the cooling water removed approximately 66% of the losses.

Tests on all of the 14 vaults equipped with water spray cooling in 1947 bear out the findings given in the test results shown above.



PROTECTOR BUSHING stud temperature rise is reduced by water spray cooling as shown on the curves. Test covers bushing stud temperature on a 1,600-amp protector. Test conditions were: no cooling, average ambient air temperature 27.8 C; with cooling, average ambient air temperature 32.6; average water rate 7.15 gpm; water inlet temperature 24 C; water outlet temperature 27 C; estimate carrying 130% of rating with inside air under 70 C

TABLE II—No Cooling vs Water Cooling—Load Limits

Second Contingency Load—150% Normal

	500-Kva Transformer				1600-Amp Protector			
	2nd Cont Load		Top Liquid Temp		2nd Cont Load		Inside Air Temp	
	Kva	% Nameplate	Rise Temp	Total Temp	Kva	% Nameplate	Rise Temp	Total Temp
No Cooling	475	95	47C	85C	431	72	32C	70C
Water Cooling	857	171	47C	85C	778	130	32C	70C
Increase by Cooling	382				347			
NORMAL LOAD								
No Cooling	317	63	21C	59C	287	48	14C	52C
Water Cooling	565	113	20C	58C	518	86	13C	51C
Increase by Cooling	248				231			

Based on estimates of additional maintenance required to prevent loss of internal pressures to keep water out of equipment, the painting of transformers and protectors, and maintenance of the vault lighting system, there have been sufficient experience and observations to warrant the application of spray cooling.

TABLE III

Condition	Normal Load Kva	% 500 Kva Transf Nameplate	% 1600 Amp Prot (600 kva) Nameplate
No Cooling	300	60%	50%
Water Cooling	500	100%	83%
Increase by Cooling	200 Kva		

Full-Time Meter Reading Cuts Cost

SPECIALIZED meter reading by full-time meter readers both in urban and rural territories of Wisconsin Power and Light Co, has reduced operating cost in certain areas and at the same time has improved the accuracy of billing to customers. This replaces the previous practice of having higher priced help do meter reading as incidental to other work of greater importance.

An Economic Formula For Watthour-Meter Retirement

Formula embraces factors which determine whether it is not more economical to install a modern meter with modern characteristics than to patch up an old meter with obsolete characteristics

W. T. CHAPMAN and A. L. CARVILL
Meter and Instrument Divisions
General Electric Co, West Lynn Works

MANY ATTEMPTS have been made to provide guides to determine when to retire an old electric meter. But such attempts have always seemed to lack a certain something—there has been no mathematical formula. For this reason, the following discussion and formula, with important factors identified and evaluated, are proposed in hopes that they will be helpful in formulating an orderly and economically sound meter-retirement policy.

The growing need for such a policy stems from the fact that meters purchased and installed from 1915-1925 or earlier, and still constituting a substantial part of utility investment, are ill-suited for most present-day loads and installation practices. Their physical life exceeds their economic adequacy, particularly in view of the job that they are being called upon to do in the form of measuring the skyrocketing consumer load (see Fig 1).

In 35 years, meter designs have experienced marked improvements, as summarized in Table I and Fig 2. The modern meter, with improved qualities, is capable of appreciably more reliable and accurate performance under prevailing load and operating conditions. Lack of some or all of these qualities in old meters marks them as obsolete. The purpose of this article is to offer a method whereby the degree of their economic obsolescence can be expressed and evaluated.

Paper presented at recent meeting of the AEIC Committee on Metering and Service Methods in Springfield, Ill.

THE FORMULA

$$CR = \text{Cost of Retirement} < CK = \text{Cost of Keeping Meter in Service}$$

$$C\frac{(1+r)^{m+n}-(1+r)^{m}}{(1+r)^{m+n}-(1+r)^{n}} < B + 0.62\,(L+M)\,\frac{(1+r)^{n}-1}{r\,(1+r)^{n}}$$

C = cost of new meter

B = cost of rebuilding and modernizing old meter

r = rate of interest, return or discount

m = probable life of new meter

L = cost of revenue lost

n = probable remaining life of old meter

M = excess cost of operation and maintenance

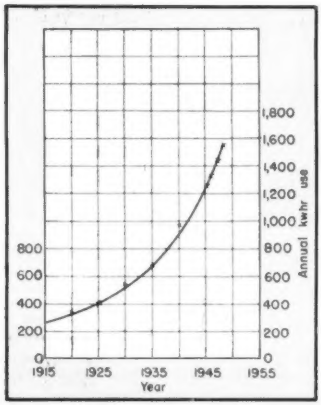


FIG 1—AVERAGE annual kwhr use—residential service increase since 1915

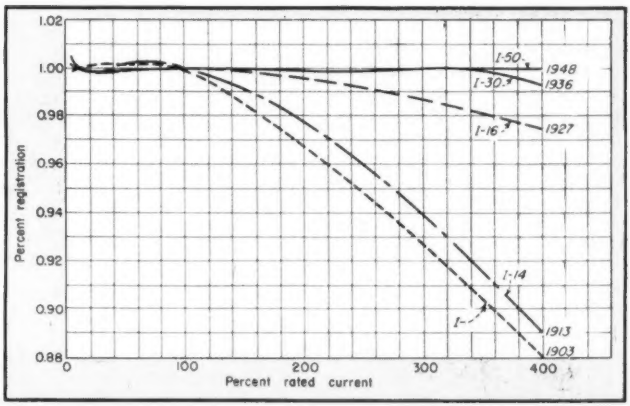


FIG 2—LOAD CURVES of single-phase meters as typified by the sequence of General Electric designs from 1903-1949 showing large registration improvement of type I-16 over I-14

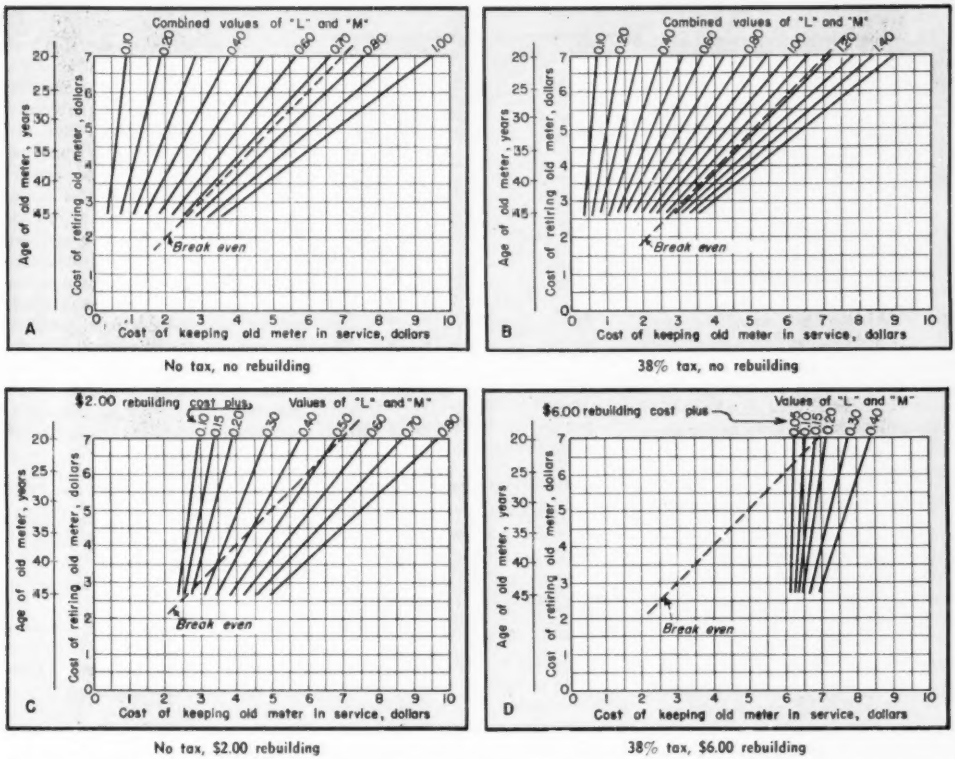


FIG 3—RETIREMENT vs REBUILDING. "Break-even" values under different rebuilding and tax conditions as compared to no rebuilding

TABLE I—Major Design Changes, Single-Phase Watthour Meters

		ELECTRICAL FEATURES			MECHANICAL FEATURES							
		Temperature Compensation			Cover						Base	
					Lower Bearing		Stud Type		Studless			
Type	Year	Permanent Magnet (Class 1)	Electro Magnet (Class 2)	Surge Proof Magnets	Pivot	Ball	Metal	Glass	Metal	Glass	A	S
DUNCAN ELECTRIC MANUFACTURING CO												
M	1912	No	No	No	X		X				X	
M2	1916	No	No	No	X		X				X	
MD	1926	No	No	No	X		X	X			X	
MD	1930	Yes	Yes	No	X		X	X			X	
MD	1930	Yes	Yes	No	X					X	X	
MF	1934	Yes	Yes	No	X	X				X	X	X
MF	1938	Yes	Yes	Yes	X	X				X	X	X
GENERAL ELECTRIC CO												
I-10	1909	No	No	No	X				X	X	X	
I-14	1913	No	No	No	X		X	X			X	
I-14	1923	Yes	No	No	X		X	X			X	
I-16	1927	Yes	No	No	X					X	X	
I-20	1934	Yes	No	No	X					X	X	X
I-30	1936	Yes	Yes	No	X	X				X	X	X
I-30	1940	Yes	Yes	Yes	X	X				X	X	X
I-50	1948	Yes	Yes	Yes	Magnetic Suspension					X	X	X
SANGAMO ELECTRIC CO												
H-1	1911	No	No	No	X		X	X			X	
H-2	1914	No	No	No	X		X	X			X	
HC	1927	Yes	Yes	No	X		X	X			X	
HC	1931	Yes	Yes	No	X					X	X	
HF	1934	Yes	Yes	No	X	X				X	X	X
J	1940	Yes	Yes	Yes		X				X	X	X
WESTINGHOUSE ELECTRIC CORP												
OA	1911	No	No	No		X	X	X			X	
OB	1924	No	No	No		X	X	X			X	
OB	1927	Yes	No	No		X	X	X			X	
OB	1928	Yes	Yes	No		X	X	X			X	
OC	1932	Yes	Yes	No		X				X	X	
C	1933	Yes	Yes	No		X				X	X	X
C	1940	Yes	Yes	Yes		X				X	X	X

By what yardstick can the economic adequacy of an old meter be appraised?

The following analysis undertakes to identify each of the economic factors involved—first, those concerned with the retirement of a meter, and second, those concerned with keeping it in service. A formula and method of calculating the cost of each of these two alternatives are developed from the analysis.

Economic considerations alone require the determination of the cost of retirement on the left side of our formula (Fig 3), and on the right side the cost of keeping the old meter in service. Retirement of a meter is indicated when the cost of its replacement is less than the cost of keeping it in service.

Determining Retirement Cost—"*CR*"

"Cost of replacement," or "cost of retiring an old meter," means excess cost, because replacement is made before the meter is physically worn out. If a meter with five years of potentially useful life is scrapped and replaced, the cost of replacement is the cost of the new meter over the five-year period during which its purchase might have been postponed. The costs to be considered are depreciation and interest or return on investment, expressed in terms of an equivalent annual charge or converted to the present worth of equivalent annual charges over the potential remaining life of the old meter. Differences in property taxes are not considered, as it is assumed that taxes will be the same on the new meter as on the old.

Cost of New Meter—"*C*"

The cost of a new meter includes its purchase price, the cost of transportation, handling, inspection, etc—generally the amount charged to plant accounts on the books. To simplify calculations of depreciation, zero salvage value for the old meter is assumed, although salvage may be deducted if present.

Rate of Interest or Discount—"*r*"

Since it may be presumed that when a new meter is purchased it is with the expectation that it can earn the full return, the rate of all interest and discount calculations should be uniform and at the normal rate of return earned by the utility. A rate of 6% per annum appears to be appropriate for general use.

TABLE II

Age and Probable Remaining Life of Old Meters

Age of Meters in Years	Probable Remaining Service Life in Years
0	30
5	25
10	21
15	17
20	14
25	12
30	10
35	7
40	6
45	4
50	2
55	1
60	0

Probable Life of New Meter—"*m*"

The probable average physical life, in years, of a new meter is based on informed conservative opinions, without regard to obsolescence. Forty years is assumed.

Remaining Life of Old Meter—"*n*"

The probable potential remaining life of an old meter can be estimated with reasonable accuracy. Depreciation data and experience are available in a number of utility companies with respect to the average service lives of various classes of meters. Adjustment of past experience must be made for retirements due to obsolescence and inadequacy. Potential physical life, not life before obsolescence, is the required factor.

Where the average life of the original group is known (or estimated), the remaining probable life of survivors of any age can be calculated by resort to survivor curves. Those developed by Iowa State College have been chosen for this purpose.* The curve best fitted to meter retirements due principally to wear, tear, and casualty is the curve designated as Type S-1. Actual experience of many companies might indicate the use of an R-type curve (usually R-2 or R-3), because obsolescence has been a major factor in their meter retirements. But for purposes of comparison, such as this, it is necessary to estimate probable physical life uninfluenced by obsolescence. The S-1 curve meets this condition.

Table II shows the approximate remaining service life for old meters as derived from this S-1 curve, based on a 30-yr average life.

Cost of Old Meter in Service—"*CK*"

The right-hand side of the formula is the sum total of all the costs of additional expenses and the value of losses as a result of the retention of old meters in service.

The first of these items *B* usually is a "one-shot" cost; the other two (*L* and *M*) are annual costs. Therefore, the cost of not replacing meters is the sum of this first item plus the present worth of the second and third items. There are certain other intangibles, mentioned later, which should not be overlooked.

Cost of Revamping Old Meter—"*B*"

Rebuilding and modernization of an old meter may or may not be necessary in order to keep it in service. The work will vary depending on the service requirements of the utility company and on the age and condition of the meters (see Table III).

Operating and maintenance costs may be considered as sources of tax savings. Whether or not to scale down the cost of rebuilding and modernizing old meters by the amount of such tax savings depends on whether betterment is involved. Individual company accounting procedures will dictate, but for purposes of this article, certain assumptions are made, as noted later.

TABLE III

Typical Maintenance and Rebuilding Costs

Following are some repair, maintenance, and rebuilding operations with typical costs applying to 5-amp, 120-v, 2-w, Type I-14 meters.

Item 1 in the list covers routine of inspection, cleaning repainting, hi-pot, testing, and adjusting, plus entering the record in file. All other items (when and if incurred) should be added to the cost of Item 1 for an estimate of the total cost. In general, Items 6-10 may be classed as betterment items.

1. Inspect, test, adjust, etc. (applies to all meters)	$1.10
2. Bearing replacement	0.40
3. Disk-and-shaft replacement	0.70
4. Magnet replacement	2.15
5. Potential-coil replacement	4.50
6. Change to 15-amp current coil plus gear	4.75
7. Change to studless glass cover	1.65
8. Addition of lightning shield	0.50
9. Addition of temperature compensation	0.25
10. Conversion to socket-type base	3.40 to 5.40

Cost of Revenue Lost—"*L*"

The use of old meters may be expected to result in some loss of reve-

* "*Statistical Analyses of Industrial Property Retirements*," by Robley Winfrey, Bulletin 125 (December, 1935), Iowa Engineering Experiment Station, Iowa State College, Ames, Iowa.

nue through their tendency to run slow, particularly on overloads. Where meters are rebuilt, the tendency to slowness may be reduced. In such cases, proper allowance should be made for probable reduction in losses resulting from the rebuilding.

For meters whose accuracy cannot be or is not corrected, it will be necessary to estimate both the average percentage of error and the average load over the remaining probable life, as determined, for calculating the cost of replacing. From these estimates, the annual loss of revenues for the number of years of probable remaining life can be calculated. Obviously, this must be done individually for different age groups. Example 1 illustrates one method.

Example 1
Evaluating the Loss of Revenue Due to Inadequate Load Characteristic of Older Meters

Determination of the amount of revenue lost on overload requires (a) knowledge of the kilowatt-hours registered at various brackets of overload and (b) the average error of the meter at these overload values.

Many studies and surveys have been made to determine the relation between the monthly total kwhr registration and the amounts of underregistration due to the overload characteristics of older type meters. One such study* reports the following:

Monthly Kwhr	Kwhr Loss Per Month at Overload	Annual Kwhr Loss	Value of Annual Loss at 3¢ per Kwhr
100	0.92	11	$0.33
200	5.4	64.8	1.95
300	14.1	169	5.08

Using the present tax rate of 38% on all corporations with annual income in excess of $50,000, only 62% *L* (lost revenue) is lost after income taxes.†

For each age group of meters, where *r* is the rate of discount, where *n* the probable remaining average life of the group of meters, and *L* the average annual loss of revenues of the entire group, the present worth of the cost of future revenue losses

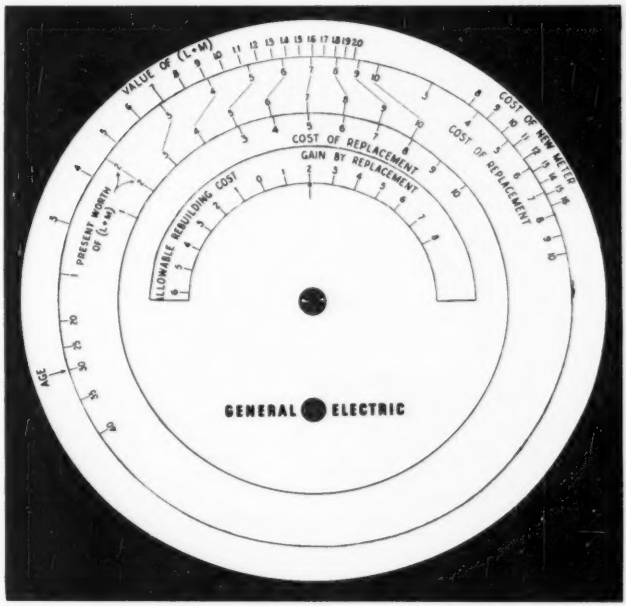


FIG 4—SUGGESTED DESIGN of slide-rule calculator to learn retirement feasibility

can be calculated by means of the following:

$$\text{Present worth of future revenue losses} = 0.62\,L\,\frac{(1+r)^n - 1}{r\,(1+r)^n}$$

Operation and Maintenance—"M"

A new and improved meter, particularly during its early years—ie, the period of remaining probable life of the old meter that it replaces—would require very little attention. Such annual operating and maintenance costs that a new meter might require during this period should be deducted from the estimated average annual operating and maintenance cost of an old meter (see following Example 2).

Example 2
Evaluating the Excess Cost of Operation and Maintenance Of Older Meters

Operations and maintenance expense incident to maintaining an old meter in service invariably exceeds that of a new meter. This difference or excess is one of the annual items of cost of keeping old meters in service as compared with replacement. Various means may be used to arrive at the amount of this difference, one of which is illustrated as follows:

Operation and maintenance expense of one large operating group:

Average cost per meter per year	$1.30
Cost of each periodic test (each 6 yr)	$1.80
Average annual cost of period test per meter	.30
Average annual operation and maintenance expense excluding periodic test (per meter)	$1.00

The $1.00 figure covers sets, removals, shop work, repairs, tests, etc. A substantial portion of it results from changeouts because of inadequacy, burnouts, defects, and failures of old meters. Operation and maintenance accounts, therefore, get charged for all of this plus the cost of work done in the shop on such meters. Appraised on this basis, the breakdown of total operation and maintenance expense, per unit, as between new and old meters might average 75% attributable to an old meter and 25% to a new meter. Actual operating experience might suggest different values, but these are assumed to be reasonable. From these figures, an excess of $0.50 is accounted for in the annual average cost of maintaining an old meter in service as compared with that of a new meter.

* A. J. Keen's paper on Meter Obsolescence presented at the fall meeting of the Meter Committee of the Pennsylvania Electric Association, October 1948. Also Electrical World—September 10, 1949.

† In states with corporate tax based on income this rate should be modified to give effect to such state tax.

Where 0.62 represents the tax factor and M is the average annual excess cost of operating and maintenance of the old meters, the present worth of this portion of excess cost of operation and maintenance can be calculated by means of the following formulas:

$$\text{Present worth of excess cost of operation and maintenance} = 0.62\,M\,\frac{(1+r)^n - 1}{r\,(1+r)^n}$$

The factors, B, L, and M, described above, when combined mathematically, give the right-hand side of the formula—"Cost of Keeping Old Meter in Service—CK."

Intangible Factors

Since this study is confined to an economic analysis, no attempt is made here to evaluate some of the intangibles that weigh on the side of retirement.

For example, the modern installation of the outdoor socket-mounted-type meter offers greatly improved protection against diversion. Lack of this quality in the older-type installations warrants an appraisal of the insurance value against future loss of revenue. Another example is the effect on operation and maintenance costs resulting from possible changes in the rules of state regulatory bodies. Such rules, if changed to require that meters beyond a certain age be placed on a shorter test cycle, would result in cost increases. Another of the intangibles is insurance against burnout due to overloads, lightning, etc—with resulting service interruption, loss of revenue, customer good will, etc.

How to Use the Formula

A simple and convenient method of applying this formula is to express the quantitative values by means of charts.

If calculations are made for a given set of conditions using the formula, charts can be plotted which will show at a glance whether, under the conditions assumed, it is economical to retire an old meter.

It is necessary first, however, to establish values for all of the factors involved that fall into two groups: namely, constants and variables.

Constants comprise the following. The value shown opposite each is the one used throughout the calculations for the accompanying charts:

r	Interest or discount rate	6%
m	Average life of a new meter	40 yr
c	Cost of a new meter	$11.00*
	Federal Income Tax (when applicable)	38%
	Average life of the old meter	30 yr
	Survivor Curve	S-1

* $11.00 is selected arbitrarily for reasonable ease of carrying calculations forward. It is a "representative" or prototype cost of present-day, single-phase meters.

Variables comprise the following. These are the factors for which more than one value is to be used in the calculations for charting:

M = Annual excess operation and maintenance cost

L = Annual cost of future loss of revenue

B = Cost of rebuilding or modernizing

n = Probable remaining service life of old meter

For convenience in charting, the values of M and L are combined and treated as one (see Examples 1 and 2). For the rebuilding and modernizing cost B three typical cases in amounts of zero, $2.00, and $6.00 have been charted. Where amounts in the order of $6.00 or more are used, betterment may be assumed. Actual experience costs and accounting practice will dictate correct values for specific case studies. Table III suggests some typical values for B, the rebuilding or modernizing cost.

The probable remaining life of the old meter n is a function of its age (see Table II).

Certain familiar expressions, such as the values of compound interest, present worth of annuity, etc, may be recognized in the formula. Calculations can be facilitated if interest and annuity tables are used.

The following example illustrates how the formula may be applied. The values for the constants are those listed above. The following are assumed for the variables:

Age of Old Meter = 20 Years

$M = 0.10$
$L = 0.20$
$B = 6.00$
$n = 14.42$

$$CR \text{ (Cost of Replacement)} = 11.00 \times \frac{(1+0.06)^{20} + 14.42 - (1+0.06)^{20}}{(1+0.06)^{20} + 14.42 - (1+0.06)^{14.42}} = \$6.92$$

$$CK \text{ (Cost of Keeping Old Meter in Service)} = [6.00 + 0.62\,(0.10 + 0.20)] \times \left[\frac{(1+0.06)^{14.42} - 1}{0.06\,(1+0.06)^{14.42}}\right] = \$7.76$$

Saving, if retired = $0.84

This pertains to a meter assumed to be 20 yr old.

Using the foregoing principles, typical charts have been prepared, Fig 3 (A, B, C and D).

Use of Charts

To illustrate how these charts may be used, refer to Fig 3 (D). Pick the age of an old meter (20 yr) at the left-hand side, and then follow the age line across the page from left to right, noting on the way that the cost of retiring the old meter is $6.92, then proceed over to the slanted line that is labelled $.30 (combined value of L and M) as a typical amount. Then go down the chart and read the scale at the bottom, which is $7.76.

The difference ($7.76 — $6.92), $0.84, indicates that it will be more costly to keep the old meter in service than to retire it.

Additional charts can be made to show other conditions. Moreover, these functions are reducible to slide-rule technique. Figure 4 illustrates a possible design of such a calculator in circular slide-rule form.

The objective herein has been first, to develop an evaluation of the factors that enter into a comparison of the economics of retiring a meter versus keeping it in service; and, second, to present a method of determining this comparison on a quantitative basis. It has been necessary, therefore, to make certain assumptions for the variables involved. Other values may be more appropriate to any specific case.

It is hoped that a reasonable contribution has been made to this important subject. But there is also another thought: that although the discussion has hinged around single-phase meters, a similar treatment could be applied to other metering equipment and perhaps even to other types of apparatus subject to wear and obsolescence.

Coal Siftings Saved

ONE eastern utility simplified removal of coal siftings from its stoker-fired boilers by installing a siftings hopper and discharge gate above a conveyor which runs directly to overhead coal bunkers. This eliminated crews for loading siftings into trucks and a crane for unloading the trucks.

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

Dry Chemical Adapted as Fire Extinguisher

W. E. MORGAN, JR.
Manager, Industrial Division
Walter Kidde & Co, Inc
Belleville, N. J.

A FIRE EXTINGUISHER has been developed which utilizes a dry powder for fighting electrical and intense flammable liquid fires. Such fires generate heat too severe for ordinary chemical extinguishers. The dry chemical has certain important advantages in combating outdoor fires of that kind. It is effective against Class B and C fires.

As to its properties, dry chemical (basically sodium bicarbonate) in the powder form extinguishes fire principally by absorbing heat from the flames. Also there is a limited smothering effect due to liberation of inert carbon dioxide when the powder partially decomposes in the fire, but this is secondary. The heat-absorption property serves as an insulating screen to shield the fire-fighter as he moves in on the fire.

Driven by the force of pressurized carbon dioxide a powder stream can be shot 20 ft. The dry chemical stream has enough mass and momentum to overcome updrafts of heat and outdoor air currents, and reach the base of the fire instantly.

The combination of speed, heat-absorption, and electrical non-conductance properties makes dry chemical a well adapted fire extinguishing agent for fires in electrical equipment. It is best suited for use out of doors. Indoors the fine powder is more likely to settle on electrical and other equipment. The equipment may require thorough cleaning before it can be put back into service. Cleaning may not be a major consideration where the protection of costly electrical equipment is at stake. Bearings unless enclosed, will require a thorough cleaning because the powder has an abrasive action. For most indoor electrical fires carbon dioxide is still the most effective and least damaging extinguishing agent.

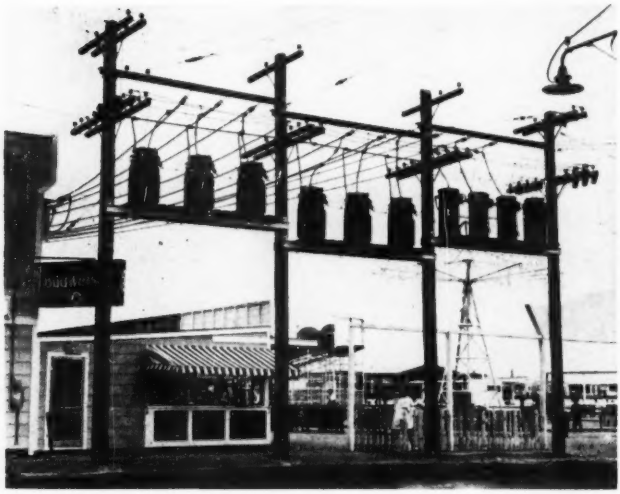
DRY CHEMICAL fire extinguisher in action. A 1,500-gal oil capacity transformer was rigged to simulate a ruptured tank; oil and gasoline was fed from pipe at top. At 15 ft away, fire in oil was attacked with dry chemical from the bottom up to prevent reflash in fuel. In less than 15 sec the flame succumbs to dry chemical discharge by pressurized CO_2

In a witnessed test, an extinguisher was put in action against a simulated transformer oil fire. Using a 20-lb capacity extinguisher at a distance of 15 ft from the fire, an operator in ordinary business suit was able to snuff out the flame in 15 sec. Before the powder supply was depleted, the same extinguisher was used to snuff out two more fires under similar conditions. In another test the dry chemical unit extinguished a 400-sq ft gasoline spill fire in less than 20 sec.

The extinguisher unit consists of two steel cylinders—larger one contains the dry powder, smaller one contains approximately ½ lb of carbon dioxide to pressurize the powder—both surmounted by a handle grip and trigger control release to which is attached a flexible hose and nozzle. When the trigger is pulled, carbon dioxide is released to a tube in the powder cylinder. Discharge at bottom of tube causes a "fluffing" of the dry chemical. As the fluffing takes place, the carbon dioxide is also released in volume through an upper outlet of the tube. This latter pressure expels the powder up through its own siphon tube, past a flow valve, into the hose and out the diffusing nozzle horn.

Economical Multi-Transformer Substation Mounting

N. W. THURSTON
Supt Station Repairs
Central Maine Power Co
Portland, Me

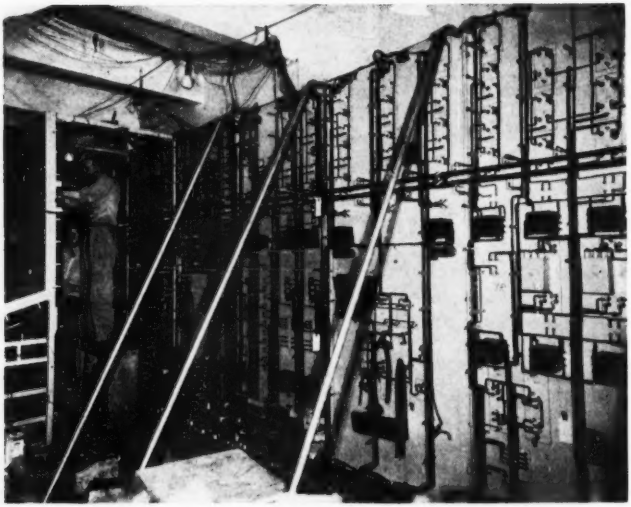


TRANSFORMER STATION has 10 transformers supported from a four-pole structure

IN REBUILDING following a disastrous post-season fire at Old Orchard Beach, Me., space was lacking for a distribution center in an amusement area. The fire had destroyed distribution transformers and other electrical equipment that had served various customers over about one square block. In reconstructing buildings along one street bordering the area—a dead-end thoroughfare terminating at the ocean front—six 50-kva and four 37.5-kva transformers had to be accommodated. The 4-pole structure of 40-ft Class I Douglas fir shown was developed for the purpose. It supported three galvanized standard transformer platforms, the central one slightly below the two end ones.

Primaries were 4.16-kv wye. Secondaries of the two 50-kva, 4-wire lighting banks were paralleled at 120-208-v, feeding the building via eight 500-Mcm conductors overhead. Three of the 37.5-kva's were for 240-v, 3-phase power. The remaining 37.5-kva transformer fed a 180-240-v single-phase lighting supply. Since all but three of the smaller conductors took off at the same angle and on the same side, special guying was required. This was done by strengthening and attaching to existing poles on the opposite side of the street. Steel angles were used to support the secondary leads toward the building.

Shop-Built Boards Speed Modernization



SHOP PRE-ASSEMBLY of control boards cuts costs and simplifies powerhouse modernization. Shipped completely wired, the board requires only field connections to terminal blocks

COMPLETE CONSTRUCTION and wiring of new switchboards before they are received on the job has enabled the Bechtel Corp to replace old boards without interrupting operation at Southern California Edison's Big Creek powerhouses.

The switchboards are built in the Bechtel power division shop at Vernon (Los Angeles). They are shipped with all equipment mounted and wired to terminal blocks at the bottom of the boards. In place on the job, field connections are made from terminal blocks to external control wires.

Shop construction effects substantial cost savings, and eliminates additional complications on an already complicated job.

NOW General Electric's HI-STROKE arrester and FLIP-OPEN cutout available as a

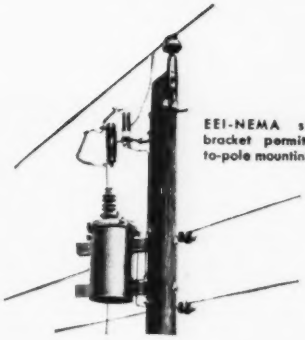
Unit-Combination Arrester & Cutout

for rural circuits

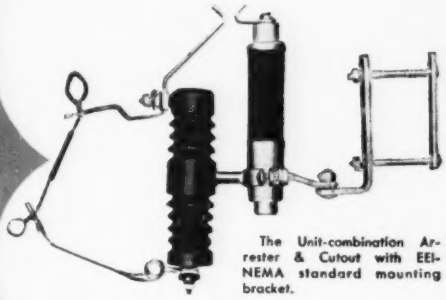
This is General Electric's new Unit-combination Arrester & Cutout—designed for low-cost protection of conventional distribution transformers on rural lines rated 7200/12470- and 7620/13200-volts Grounded Y.

Combining the basic design features of the 9 kv HI-stroke arrester and the 7.8 kv, 50-ampere Flip-open cutout, the new Unit-combination costs 20% less than these items purchased separately. It is available with either the EEI-NEMA standard mounting bracket for crossarm or direct-to-pole mounting, or an optional bracket for mounting to conventional distribution transformers.

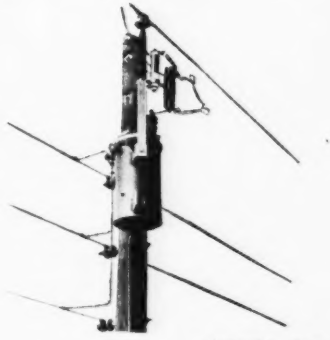
The unique combination provides close coupling between the arrester element and the cutout insulator—combining the advantages of small physical size and virtual freedom from short circuits caused by birds, yet maintaining liberal electrical clearances. The Unit-combination can be swiveled on its mounting bracket to desired location for easy replacement of fuse link. *Apparatus Department, General Electric Co., Schenectady 5, New York.*



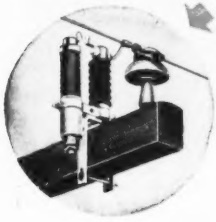
EEI-NEMA standard bracket permits direct-to-pole mounting.



The Unit-combination Arrester & Cutout with EEI-NEMA standard mounting bracket.



Optional bracket permits mounting on conventional distribution transformer.



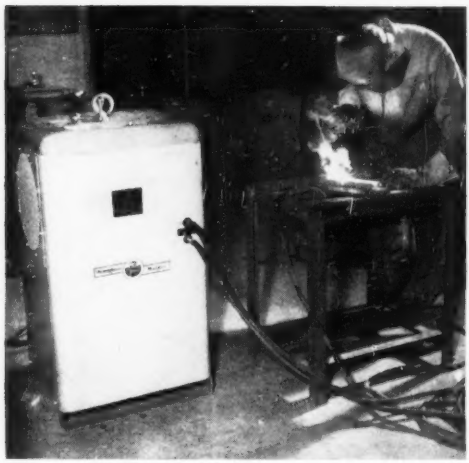
THE HI-STROKE ARRESTER, hundreds of thousands of which have demonstrated a practically perfect service operating record, combines low impulse sparkover voltage with high discharge current capacity, thus affording the best protection available in the field of expulsion-type arresters. It is the *only* expulsion arrester with a built-in reserve of gas-evolving material to compensate for erosion, and so provide increased operating life!

THE FLIP-OPEN CUTOUT features a wet-process porcelain insulator with undercut petticoats for insulation strength. Double wedge-type contacts permit a fuse link to be inserted from either side of the cutout, while helical-wound double-coil springs retard side sway of the contact arm and protect the link from vibration stresses.

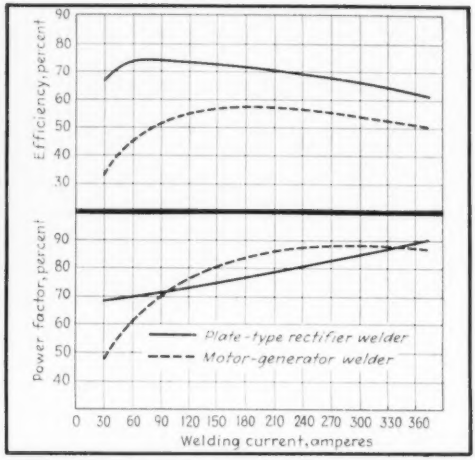
GENERAL ELECTRIC

406-302

D-C Welder Uses Plate-Type Rectifiers



NEW D-C RECTIFIER welder shown in operation, required no maintenance of any sort after being used for a number of months



COMPARATIVE PERFORMANCE of 300 amp. d-c welders. Efficiency increases at reduced load, reaching 73% at 20% rated load

NEW d-c welding machines, using plate-type rectifiers instead of the conventional rotating components used in motor-generator welding equipment, are now available from the Westinghouse Electric Corp. These welders are rated in accordance with NEMA standards for industrial type, single-operator, arc welders. They are available in 200-, 300- and 400-amp ratings.

The major components of the new rectifier-type d-c welders are: Three-phase welding transformer; three-phase adjustable reactor; and, a plate-type (selenium) three-phase, full-wave rectifier.

The no-load loss in a 300-amp welder is 500 w, as compared to 2,430 to 3,600 w for a conventional motor-generator welder. The power factor at normal operating load conditions is comparable to induction-motor-driven welders. The welder's efficiency at full load is 66%, as compared to 54% for motor-generator welders. Efficiency increases at reduced load conditions, reaching 73% at 20% rated load.

The simplicity of the welder and its lack of moving parts, the elimination of brushes and brush holders, and shunt and series fields with their attendant control requirements, greatly simplifies the maintenance and repair part problems.

Rock Salt Cleans Transformer Cooling Coils

S. M. HAMILL, JR
Manager Electric Operating Dept
The Cincinnati Gas & Electric Co
Cincinnati

ROCK SALT, carried by high velocity air, is being used to remove algae and bacteria from water cooling coils in large power transformers. Connections are made from the inlet side of the coil to the device used for supplying the rock salt. This device consists of a hand operated air valve to which is connected a short section of pipe, a pipe tee, and another section of pipe. To the tap side of the tee is installed a two quart air tight salt container equipped with a removable lid and a shutter arrangement for limiting the amount of salt fed by gravity into the pipe tee.

Better Performance
Lower Costs

After an air supply, 80 to 90 psi, is connected to the device a small amount of salt is allowed to fall into the pipe tee. The air valve is then opened allowing the air to force the salt through the cooling coils of the transformer. This is repeated a number of times until the coils are considered to be clean. Several times during these operations the coils are flushed with water.

Connections are made at the discharge side of the cooling coil in order to collect the salt and deposits which are carried through or dislodged from the inside of the coil.

Following are advantages of this method of cleaning transformer cooling coils:

1. Material and equipment required is very small.

2. By using rock salt in place of other abrasive materials, the salt can be dissolved should the coils become clogged during the cleaning process.

3. Rock salt satisfies the requirement of being a material with some abrasive qualities and yet not so abrasive as to damage the inside of the cooling coil or coils.

4. Time required to clean coils is relatively short in comparison with other methods.

5. Results obtained have been very satisfactory.

SILVER CONTACT SURFACES

to eliminate oxidation troubles

AT NO INCREASE IN PRICE

POWER CONNECTORS

SILVER is used exclusively on *all* G-E connectors because it allows power to flow between conductor and connector with no losses or overheating. This helps eliminate annoying oxidation problems that are a definite maintenance item. The more a connector heats up, the more it oxidizes; and the more it oxidizes, the more it overheats. This vicious cycle continues until the connector fails.

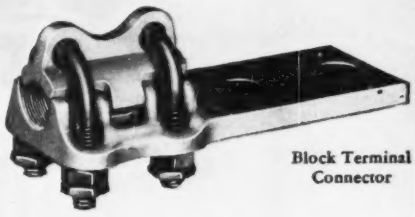
CORRECT MATERIAL for the job is another feature assuring you that G-E connectors "run cool." The composition of the alloy used permits the connectors to carry the maximum current of any conductor on which they are used . . . with no losses and without overheating. By using G-E connectors you're assured of long connector life because of silver contact surfaces and ample current-carrying capacity; double safeguards against oxidation troubles and they don't cost you a cent extra.

CHECK THESE ADDITIONAL FEATURES . . .

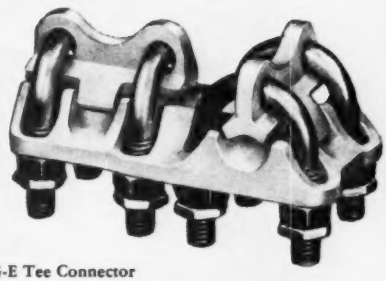
SERRATED CONTACT SURFACES give extremely high pull-out strength and a permanent, high-conductivity joint that will resist vibration and give positive pressure on the conductor at all times.

NON-CORRODIBLE HARDWARE is of high-strength bronze alloy that gives tight and trouble-free service. G-E connectors will not twist, distort, or season crack.

INTERLOCKING SIDES confine the strands of the conductor within the conductor enclosure, thus obtaining full advantage of the conductor's current-carrying capacity.



Block Terminal Connector



G-E Tee Connector

Place an order today with your G-E sales representative and start realizing the many benefits to be gained by using this new line of General Electric connectors. Also, write for a copy of bulletin GEC-400 that contains 40 pages of valuable information on G-E connectors, and see for yourself how easy they are to order. Write to *Apparatus Department, Section 856-52, General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

NOW

AN 8-STEP REGULATOR FOR THE PRICE OF A 4-STEP

This is General Electric's new ML8 Step Voltage Regulator. It supersedes the 4-step ML4—at no increase in price. It provides 10% automatic voltage regulation, in eight $1\frac{1}{4}\%$ steps—which means better service on rural feeders.

Closer regulation, smaller steps, increased capacity, widens the field of application to urban fringe areas at low installed cost and with minimum maintenance.

Ask your local G-E office for additional information, or write to ***Apparatus Department, General Electric Company, Schenectady 5, N. Y.***

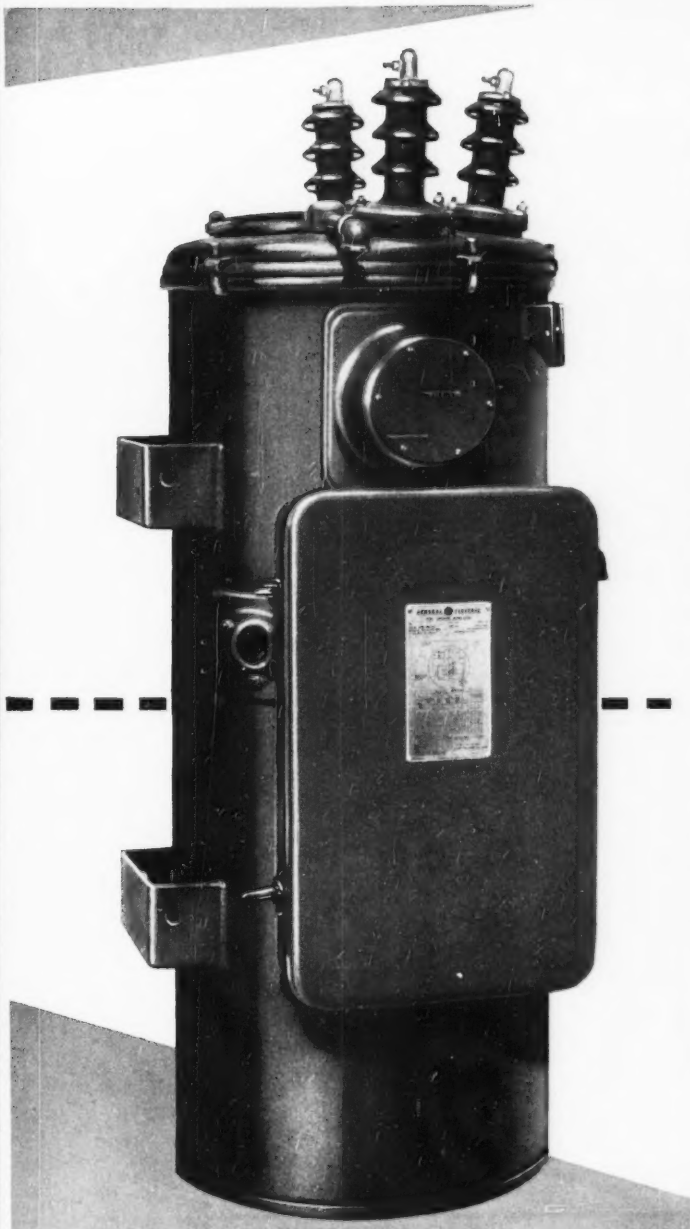
Standard Regulator Ratings

Rated Load Amp.	Nominal Circuit Voltage	Regulator* Voltage Rating	Regulator KVA at Rated Voltage	Circuit KVA at Rated Voltage
50	2400	2500	12.5	125
100	2400	2500	25	250
150	2400	2500	37.5	375
50	4800	5000	25	250
100	4800	5000	50	500
25	7200	7620	19	190
50	7200	7620	38.1	381
75	7200	7620	57	570
100	7200	7620	76.2	762
25	7620	7620	19	190
50	7620	7620	38.1	381
75	7620	7620	57	570
100	7620	7620	76.2	762

*A simple tap change will allow the units rated 5000 volts to be used on 4330 and 2500 volt lines, and the units rated 7620 volts on 6900, 7200 and 7960 volt lines.

Load amperes can be increased above rating, with no overheating and no increase in losses, with the regulator connected as follows:

When Regulator is Connected for:	%Rated Amp Can be Applied:
$2\frac{1}{2}\%$ lower to $7\frac{1}{2}\%$ raise	120
5% lower to 5% raise	160
$7\frac{1}{2}\%$ lower to $2\frac{1}{2}\%$ raise	140
10% lower to neutral	120



Better Construction than ever before!

The shockless, snap-action Geneva gear drive—similar to the time-tested type ML4—assures accurate, positive positioning of contacts in the ML8. It has an improved switching circuit, employing the same bridging reactor principle as used for tap changing under load on large power transformers. The need of lubrication is eliminated because the complete switching mechanism, including the operating motor, is all-immersed.

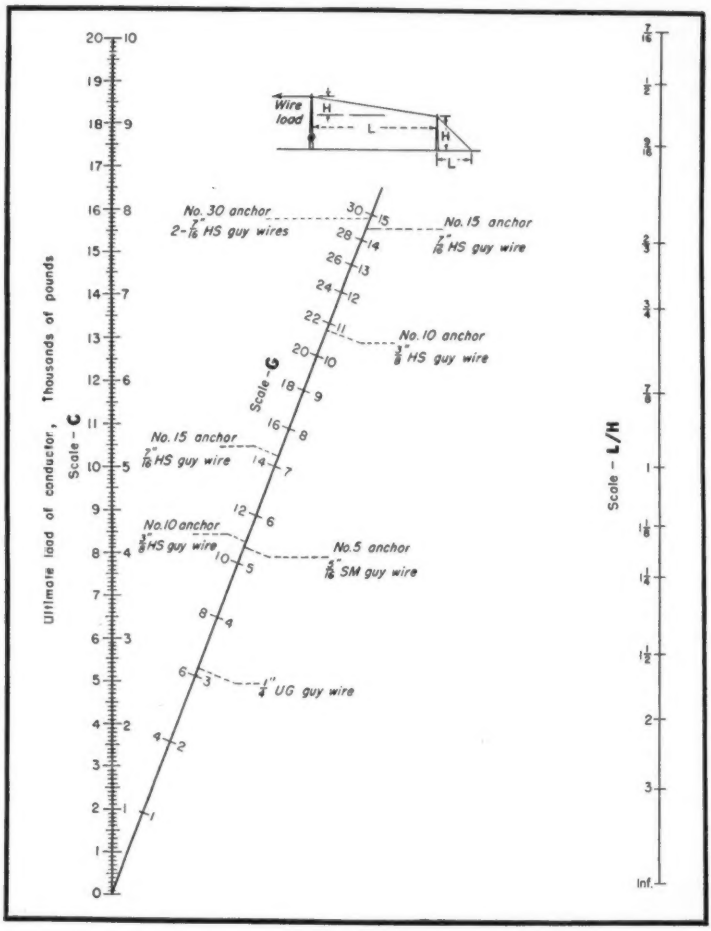
Control cabinet is now identical to that used with the more expensive IR5 induction regulator, including shelf which locks door open while providing a handy place for portable instruments. Cabinet may be mounted separately if desired.

All ratings are now furnished in sturdy round resistance-welded tanks—finished with the same long-lived melamine-modified Glyptal that has cut repainting costs on Spirakore transformers. Core and coils, too, are of compact Spirakore design as they were in the ML4.

GENERAL ELECTRIC

Pole and Anchor Guy Application Chart

An adaptation from construction methods of
Pacific Power and Light Co, Portland, Oregon



INSTRUCTIONS FOR USE OF CHART

1. Locate dead-end and angle-guy anchors wherever practicable so that L/H is not less than $\frac{3}{4}$ or greater than $1\frac{1}{4}$ preferably so that $L = H$ $(L/H = 1)$. Locate side anchors, preferably so that $L/H = \frac{3}{4}$. Attach guy on pole as near to load as practicable but be sure to maintain clearances.

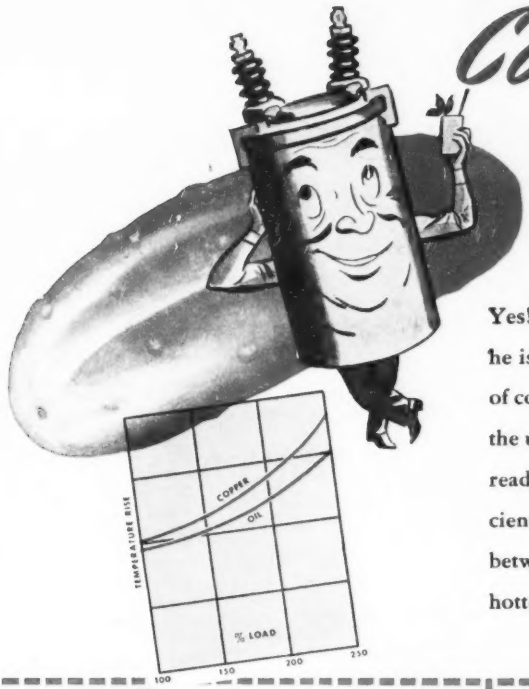
2. Determine L, H, as indicated in the small inset diagram on above chart, by actual measurement.

3. Apply appropriate safety factors to load being guyed before entering chart.

4. Place straightedge between point on scale C representing load to be guyed and point representing L/H ratio. Point of intersection on scale G determines guying requirements.

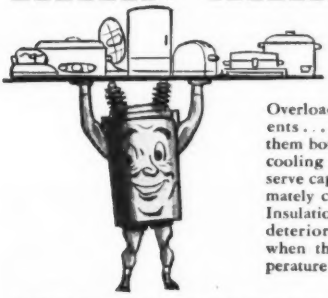
5. Note: Two values are given on scales C and G. Values on right side of scale C are to be used with values on right side of scale G.

Cool as a CUCUMBER!



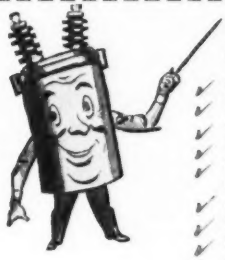
Yes! "Hi" HiperCore is cool as a cucumber, because he is designed to be cool. He is made with a core of cold-rolled, oriented silicon steel which permits the use of a smaller, narrower, and therefore more readily cooled coil. His numerous and more efficient cooling ducts provide greater contact area between the winding and the oil resulting in lower hottest-spot-over-oil temperature.

ME49-20



Overloads or High Ambients . . . HiperCores take them both in stride. Better cooling means greater reserve capacity for that ultimately certain emergency. Insulation materials in oil deteriorate more slowly when the operating temperature is reduced.

HiperCore Transformers will provide longer, trouble-free service than older style transformers. HiperCores have a longer life expectancy, thanks to advanced Surge-Tested Design and the use of a high factor-of-safety in the application of the insulating materials.

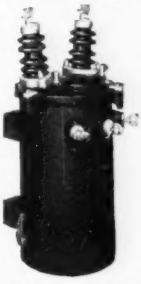


CHECK HIPERCORE PLUS FEATURES!

- Lower Hottest-Spot-Over-Oil Temperature
- Longer Operating Life
- High Factor-of-Safety in Design
- Lighter Weight
- Smaller Size
- Greater Short-Time Overload Capacity
- Better Voltage Regulation
- Superior Tap Changer

HiperCore

Photo shows 5 Kva, 7200 to 120/240 volts Conventional Type HiperCore Transformer. HiperCore Transformers range in size from 3 Kva to 50 Kva inclusive. Write for Bulletin H-303 for complete information about HiperCore Transformers.



MOLONEY ELECTRIC COMPANY

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONTARIO, CANADA

Metering with Current Transformers Inside Power Transformer Delta

Five arrangements for metering in high voltagle circuits, where for structural or other reasons, it is desirable to place current transformers inside the power transformer delta

H. S. EDGERLY
Switchgear Div, General Electric Co
Philadelphia, Pa.

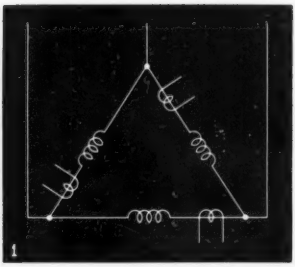
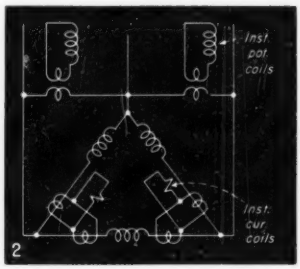


FIG 1 — Arrangement indicates placement of current transformers inside the power transformer delta

FIG 2—Standard 3-ph metering can be used if two current transformers are applied in each of two phases to derive the line current on summation



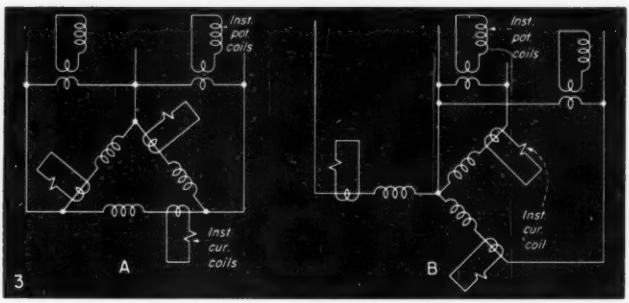
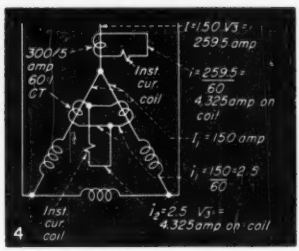


FIG 3—When only three current transformers are available, circuit power can be measured by a 3-ph, 4-w instrument with three current and two potential coils as in (A) delta circuit and (B) wye circuit. A comparison will show how the same voltage and currents are derived from both circuits ←

FIG 4—If current transformers are rated for phase current, instruments with special windings are necessary since at full load the current on the instrument winding equals 1.73 times 5 amp or 8.66 amp. To avoid the use of special instruments, the primary rating of the current transformers should be the same as though they were to be connected in the line. The diagram, showing the magnitude of secondary currents based on line transformers versus phase transformers, indicates clearly that the same instrument currents are obtained either way so that standard 3-ph, 3-w instruments may be used →



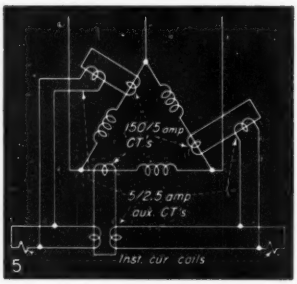
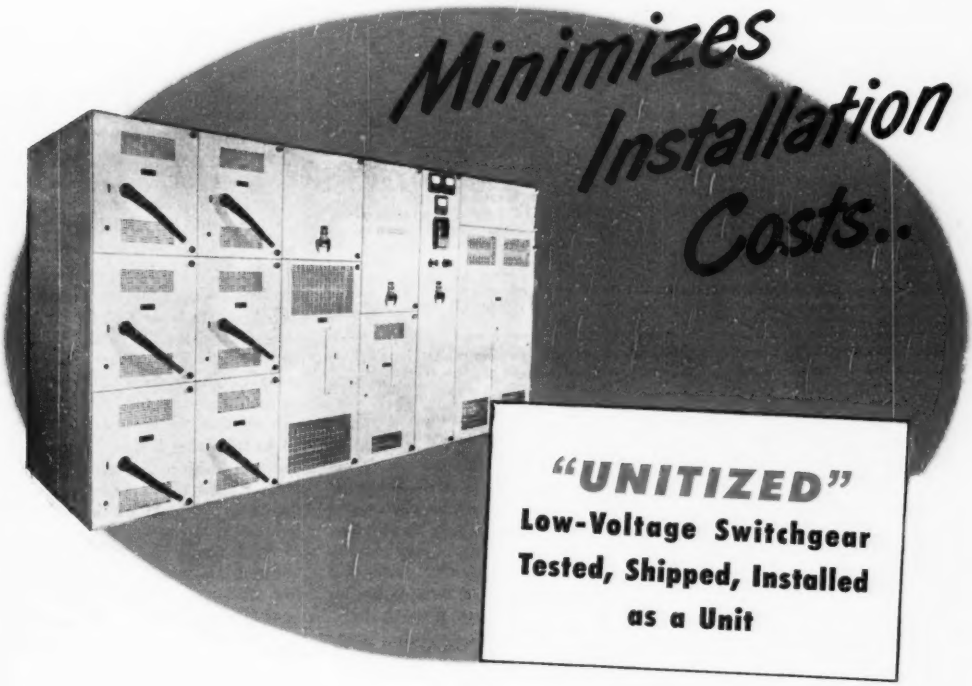


FIG 5—Instances occur where only three current transformers are available as shown in Fig. 1, yet standard 3-ph, 3-w (2-element) metering is desired. This can be accomplished by the use of four auxiliary transformers of 2:1 ratio, as shown in the diagram, retaining current transformers rated for phase current. Here the phase current transformers are 150 amp instead of 300 amp as shown in Fig 4, yet by this use of 2:1 auxiliary transformers, the overall ratio is 60:1 and the final results are the same as shown in Fig 4

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



Westinghouse Switchgear goes right "on the line" without delays or high expenses in wiring or handling. All units are completely assembled, wired and tested before leaving the factory. Groups of assembled units reach the purchaser's plant ready to set in place and put into operation.

Factory tests assure hair-line accuracy in meters, relays and breakers. The Westinghouse "Unitized" method of building, shipping, installing and operating switchgear is your best way to cut costs, and save time . . . yet retain all the benefits of dependable performance and "custom-built" flexibility.

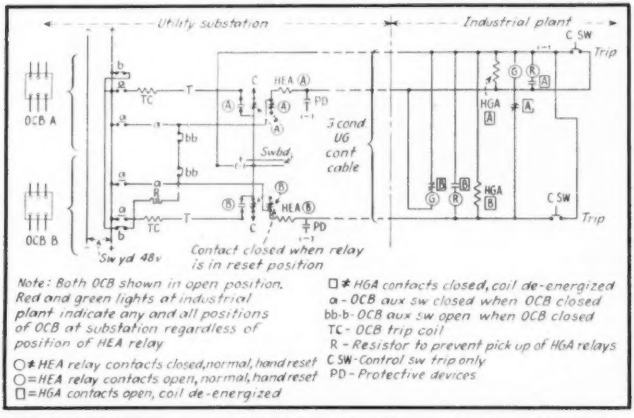
HERE'S COMPLETE information . . . The new Low-Voltage Switchgear Book gives clear, concise answers to your questions, plus complete ordering and installation data. Ask your Westinghouse representative for your copy of B-2296-D, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-60714

Westinghouse

"UNITIZED"
LOW-VOLTAGE
SWITCHGEAR

Terminal Auxiliaries Increase Control Cable Range


Utility substation
Industrial plant
C SW
Trip
OCB A
OCB B
TC
HEA (A)
HEA (B)
PD
3 cond UG cont cable
Swbd.
HGA (A)
HGA (B)
C SW
Trip
Sw yd 48v
Contact closed when relay is in reset position
Note: Both OCB shown in open position. Red and green lights at industrial plant indicate any and all positions of OCB at substation regardless of position of HEA relay
○≠ HEA relay contacts closed, normal, hand reset
○= HEA relay contacts open, normal, hand reset
□= HGA contacts open, coil de-energized
□≠ HGA contacts closed, coil de-energized
a - OCB aux sw closed when OCB closed
bb-b - OCB aux sw open when OCB closed
TC - OCB trip coil
R - Resistor to prevent pick up of HGA relays
C SW - Control sw trip only
PD - Protective devices

ONE 3-CONDUCTOR control cable with terminal auxiliaries provides trip and lamp indications for two oil circuit breakers at an industrial plant without additional conductors

SOMETIMES conditions arise where a control cable of a required number of conductors is not available or circuit requirements change after procurement of the cable. The diagram shows the remote trip control and lamp indication for two oil circuit breakers at an industrial plant. The plant is a short distance from the utility substation which has two 13.8-kv cables tied directly to the industrial buses.

JOHN I. HURSH
Auburn, Indiana

The open and closed positions for both breakers as well as trip control is accomplished by only three wires. The auxiliaries to make this possible consist of one type HGA relay for each breaker located at the industrial plant, and a resistor "R" with necessary breaker auxiliary switches, at the substation.

It will be noted that when either breaker is closed the HGA relay is energized through the HEA relay coil. The red lamp d-c voltage is provided through the closed contacts of the HGA relay. Green lamp indication is prevented by the HGA relay and breaker "a" auxiliary switch opening the green lamp circuit. When either breaker is open the HGA relay of that circuit is de-energized and the closed contact lights the green lamp by positive feed back through the "a" auxiliary switch and HEA relay of the other line closed breaker.

When both breakers are open positive feed back for the green lamps for both breakers is secured through the common resistor "R" and "bb" and "b" auxiliary switches at each breaker. The resistor "R" is high enough to prevent the HGA relays to pick up, thus the green lamp circuits for each breaker is closed from negative to positive through the other breaker HEA relay. Testing was employed in selection of the value of resistor "R" so as to prevent pick up of HGA relays and still provide a sufficient brilliancy of green lamps. For clarity, only the breaker and relay wiring is shown involving the three-wire trip and lamp indications at the industrial plant..

Bonding Changes Eliminate Cable Sheath Corrosion

CABLE SHEATH corrosion due to galvanic potentials between the lead sheaths and copper bond wires on the company's underground system has now been practically eliminated. Before corrective action was taken, records show that cable failures due to all types of corrosion were below 1.0 per 100 miles of cable per year; the average for a 20 year period was 0.41 failures per 100 miles per year. The failures due to local cells have averaged slightly less than three per year.

In investigating and mitigating the causes, particular attention has been given to the problem of lead corrosion due to local cells. This was done because these problems are expected to increase when rails are removed as trolley lines are replaced by buses.

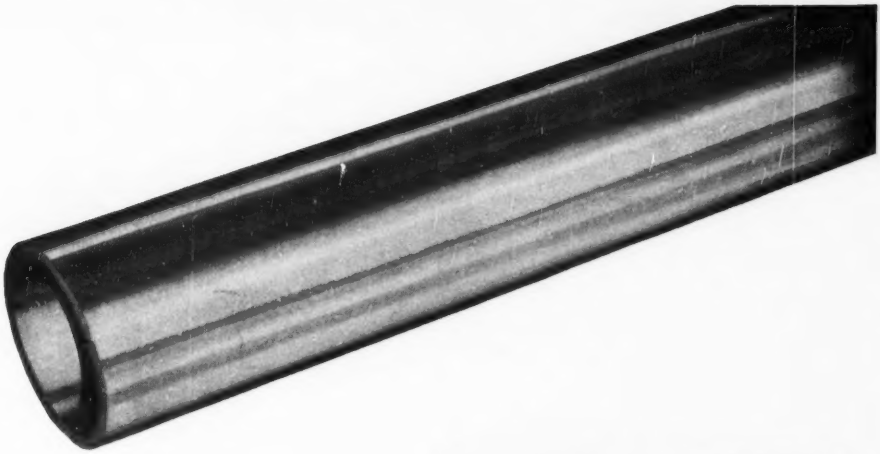
Considerable corrosion due to the

L. F. GREVE
Corrosion Engineer
Commonwealth Edison Co
Chicago, Ill.

contact of dissimilar metals has been experienced at points where copper bond wires are soldered to the lead cable sheaths in the manholes. Lead is electrically positive to copper in the electromotive series and when the bonding connection is not properly made, and moisture is present to serve as an electrolyte, a galvanic cell may be established. Where cable sheath corrosion occurs, the soldered connection closes the circuit and current will flow from the lead through the electrolyte through any portion of the bond wire in partial contact with the lead outside of the soldered connection. That flow removes a quantity of the metal in the anodic areas and transforms it into metallic ions.

Investigation revealed that old bonding practices actually increased corrosive action in several ways. The most common of these were: (1) Leaving a free end of the bond wire in contact with the sheath beneath the fireproofing material, (2) permitting the wire to parallel the sheath a short distance adjacent to the soldered connection, and (3) failing to remove the tie wire used to hold the bond wire in place while it was being soldered.

In the case of heavier bond wires which are used on high-voltage, single-conductor cables, where a much larger bond connection is required, the corrosive condition was sometimes set up by not having the wire soldered



Copper Tubes

FOR HIGHEST A. C. EFFICIENCY...

TUBULAR SHAPES offer the lowest impedance to the flow of alternating current. Watt losses are accordingly low by comparison with other conductor shapes.

Greater rigidity . . . the possibility of increasing current capacity by water or oil cooling . . . comparatively low corona discharge at high voltages . . . are other advantages offered by tubular conductors.

In this as in other shapes, copper is generally recognized as the most satisfactory bus material. For in addition to high electrical and thermal conductivity, copper provides strength, toughness and corrosion resistance.

For detailed information on the range of sizes and shapes in which Anaconda Bus Conductors are furnished, write for Publication C-25.

47184

BARS require minimum space, may be bent or twisted, connected to apparatus without special joint preparation and in laminated construction have unlimited d.c. capacity.

TUBES provide the highest bus conductor efficiency at a.c. frequencies, have greater rigidity, and may be oil or water cooled.

CHANNELS have large surface area, reduce temperature rise, provide greater rigidity than tubes for long runs and have flat surfaces for tap-off.

ANGLES for ventilated hollow busses have highest rate of heat dissipation, handle greater current density, but require more space for installation.

CABLES solve many problems in conducting extremely heavy currents in confined space or in connecting moving apparatus such as furnaces of the arc or resistance types.

ANACONDA

Anaconda

BUS CONDUCTORS

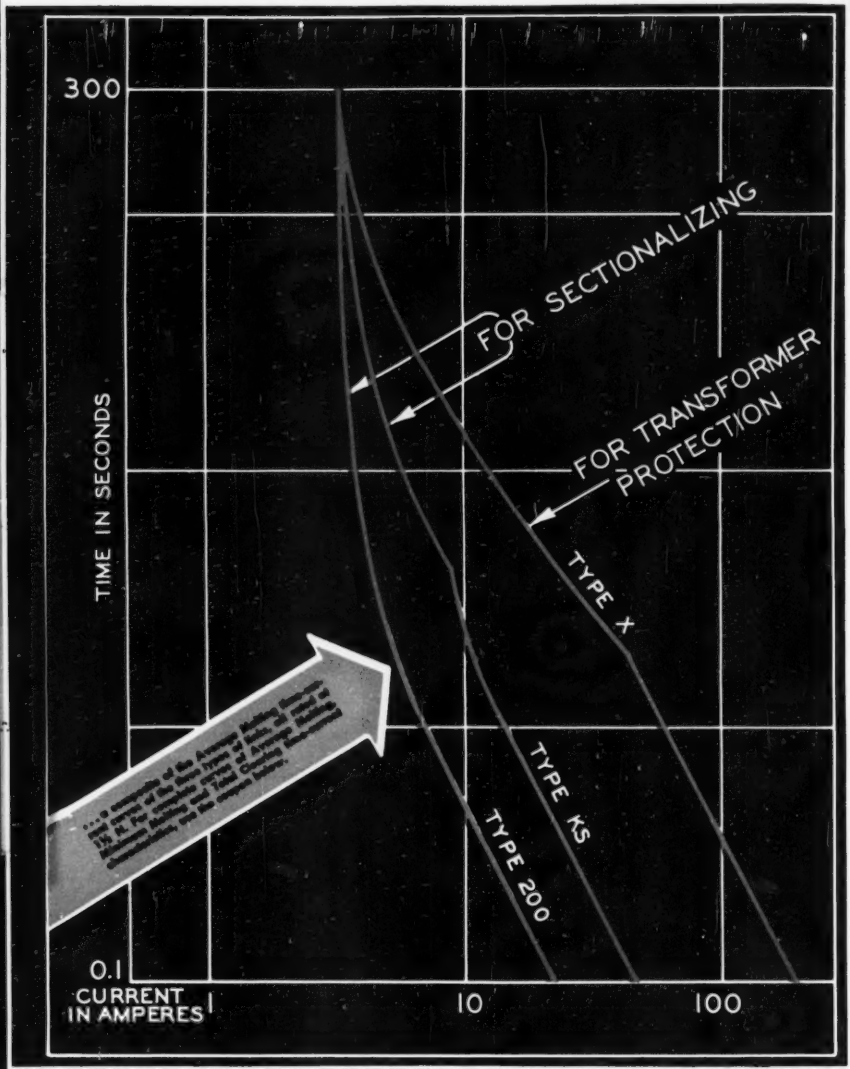
THE AMERICAN BRASS COMPANY

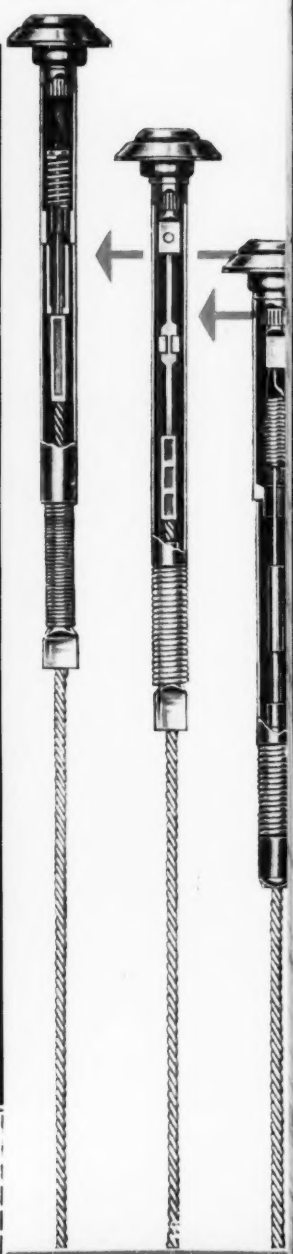
General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD.
New Toronto, Ont.

3 Speeds for Better





JAMES R. KEARNEY CORPORATION
4236 Clayton Avenue
St. Louis 10, Missouri

13

Gentlemen:

Please send me the complete set of time-current curves on the fuse links checked below:—

- ☐ TYPE 200
- ☐ TYPE K-S
- ☐ TYPE X

Name .....

Company .....

Address .....

BETTER

Fuse Co-ordination

with KEARNEY FUSE LINKS

FAST — **The Kearney Type 200 Fuse Link Isolates Those Troublesome Circuits, Maintaining Service on Adjacent Lines**

MEDIUM — **Reducing Outages on Circuits Subject to Switching and Minor Lightning Surges is a Job for the Type K-S**

SLOW — **The Type X Link Combines Small Transformer Protection With Slow Surge Response, Providing Maximum Service**

Type 200 . . . Certain circuits prove to be more troublesome than others. When a line is subject to dangerous long-time overloads and surges, continuity of service in adjacent circuits demands fast action in isolating the troublesome line. This fast action protection is made possible by the accurate, durable characteristics of the pure tin used in the Type 200 Fuse Link. The low temperature operation of this link assures that peak loads may be carried without danger of outages. This two-in-one feature of the Type 200 Link makes it a "must" in any efficient fuse-coordination plan.

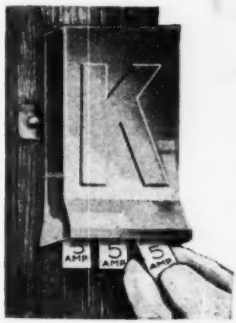
Type K-S . . . Where switching, motor-starting and lightning surges are common, maintain service by using the Type K-S Fuse Link. Low temperature operation accommodates peak loads and dragging overloads with full protection to line equipment and without damage to the cutout. High surge capacity means that the K-S Fuse Link can differentiate between harmless surges and overloads, and those that are damaging. In a thorough coordination plan, fuse links must coordinate not only with other fuses, but also with circuit breakers, and the medium speed characteristic of the K-S Link provides for the proper teamwork.

Type X . . . Designed to match the safe-loading curves of small transformers, the Type X Fuse Link keeps transformers in service during heavy overload periods and surges, and yet fuses in an instant when faults persist or reach dangerous ranges. The slow speed operation means satisfied customers and lowered expense due to unnecessary outages. The high breaking strength of the Type X Link provides security against mechanical failure in applications where apparatus-jarring surges are frequent. Like the other fuses of the Kearney line, the Type X is designed to open at approximately 220% of rated current in five minutes.

An Exclusive Kearney Feature

An added convenience with all three fuses of the Kearney line is the PUL-TAB FUSE-PAK. Individually wrapped fuse links are packaged in groups of five and cartons of 25, combining maximum protection with the handiness of the PUL-TAB. Fuse ratings are indicated on the TAB, assuring positive identification in the field.

Fuse Link Dispenser . . . Keeping the right link at the right place, at the right time, is easy with the Fuse Link Dispenser. Specially designed for mounting on poles at the cutout location, the dispenser will hold one PUL-TAB FUSE-PAK containing five links.



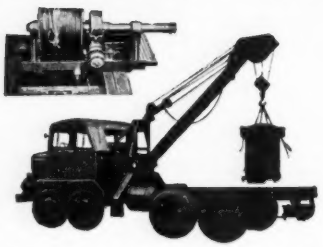
Always Specify JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. *for the Job . . .*

-143

CONSTRUCTION – *SAFER* MAINTENANCE

Utilities Have Specified
SILENT HOIST Equipment
• Since 1918 •

KRANE KAR Swing Boom Mobile Crane: for materials-handling . . . lifting, transporting, positioning, gasoline or Diesel, 1½, 2½, 5 and 10 ton capacities, 9 to 37 ft. booms (or telescopic booms), solid or pneumatic tires. Self-stabilizing without jacks or outriggers; unobstructed vision; fast, flexible, safe, easy to operate.



WINCHES: Capstans; Single and Double Drum, Jaw Clutch, Keyed and Friction Clutch Winches. 2,000 to 50,000 lb. Capacities.

SWING BOOM CRANES: Truck; Motor Power Operated; high capacity; takes up only a small space. For handling transformers, cable reels, lamp posts, trees, poles, manhole castings, etc. 9 to 31 ft. booms; one to 10 ton capacities.

TOWERS: 2 or 3 section type and Pantograph types, with plain, revolving or racking platforms.

TRIPOD POLE DERRICKS: for 35 ft., 45 ft., and 60 ft. Poles; single piece or telescopic side legs; removable cast steel fittings.

USERS: AT&T; N. Y. Tel. Co.; T.V.A.; Consolidated Edison Co.; W.U.; Municipalities throughout America.

WRITE FOR CATALOGS:

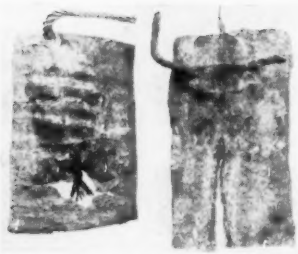
No. 79—KRANE KAR *No. 70—Truck Equipment*

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

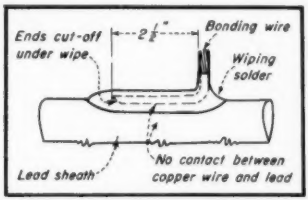
½, 2½ AND 10 TON CAPACITIES

KRANE KAR

SILENT HOIST & CRANE CO.
862-63rd ST., BROOKLYN 20, N. Y.



CORROSION due to local cells such as the two shown here, was eliminated by changes made in the bonding specifications



IN NEW BONDING METHOD the bonding wire approaches cable at right angles and this, with careful wiping, eliminates contacts between copper and lead

to the lead in the center of the connection. This was probably caused by: (1) Improper tinning of the lead, or (2) the application of insufficient heat during the soldering process. Moisture entering along the strands of the bond wire furnish the electrolyte, thereby completing the galvanic cell. Accompanying illustration shows typical cases of lead sheath corrosion resulting from improper bonding methods.

The investigation resulted in changes being made in the bonding specifications with special attention being given to remove these basic causes thereby preventing the establishment of galvanic cells between the lead sheath and the copper bond wire. In the old specification the bonding wire laid along the cable sheath so that there was contact between copper and lead. Sometimes a "pig tail" of bonding wire was allowed to stick out of the wipe causing galvanic action to occur as shown at the left in the picture.

New specifications provide for bonding cable to approach cable at right angles and to eliminate contact between copper and lead by careful wiping. Also under the new methods no "pigtails" are left sticking out of the wipe, increasing corrosion susceptibility.

70-ft Towers Relocated With Conductors in Place

LINE TOWER relocated. Conductors were removed from insulators and run through snatch blocks. Tower was guyed, lifted by crane, moved 6 ft to new location, raised and bolted into place (shown) on legs 8 ft higher than original supports. A former support can be seen close to ground and in front of tower. This is typical of the operations to relocate six 70-ft steel towers

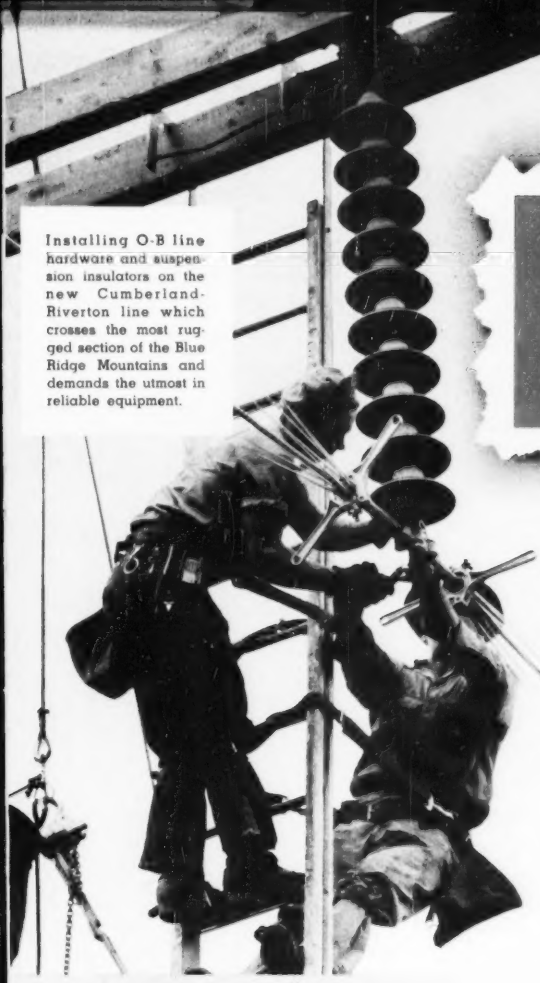
THE JOB of raising and moving six 70-ft towers has recently been completed by The Niagara Falls Power Co with a maximum of speed and a minimum of expense. Relocation was necessary to increase the clearance over a new electric railway spur track into a Niagara Falls industry.

The towers had to be elevated 8 ft and moved to new "legs" 6 ft away. Total weight of the towers and the two 12-kv circuits carried on them approximated 7 tons.

After the circuits were made dead, and the markups obtained, the tower to be moved was guyed four ways—east, west, north and south.

All of the conductors were taken out of the insulator clamps and placed in snatch blocks attached to the crossarms. This was done so that the tower could be moved parallel to the conductors to the new foundations.

Following are the steps in relocating each tower. (1) The 20-ton crane was moved into position and the 75-ft



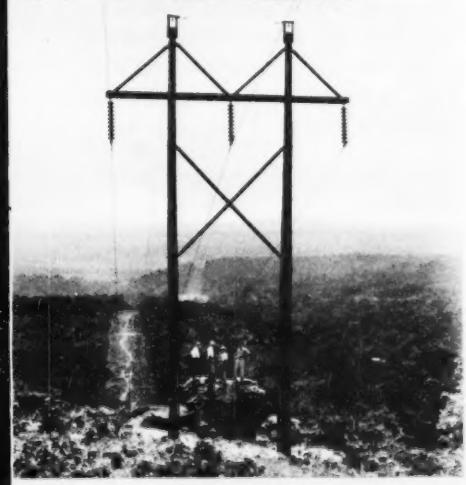
Installing O-B line hardware and suspension insulators on the new Cumberland-Riverton line which crosses the most rugged section of the Blue Ridge Mountains and demands the utmost in reliable equipment.

HI-TENSION NEWS Junior

Critical Requirements of New Potomac Edison Line Met By O-B Insulators and Hardware

Built on a calculation of only two lightning outages per year, per 100 miles, this new 132-kv line of Potomac Edison Company presented some serious construction problems. Official annual storm days total 45, and may go considerably higher in the heart of the Blue Ridge Mountains which the line crosses. Measured ground resistances vary from a low of 2 ohms to readings exceeding the scale of a 300-ohm instrument on some of the 21 separate mountains, all above 1,000 feet, in the 60-mile path of the line. Abrupt grades and difficult access complicate construction as well as inspection and maintenance.

Equipment selection was scrutinized with unusual care by company engineers, since the total output of a new generating plant hangs on this line. In the light of this care, and based on adequate past experience and its own operating records, Potomac Edison specified O-B suspension insulators and hardware on this important new project.

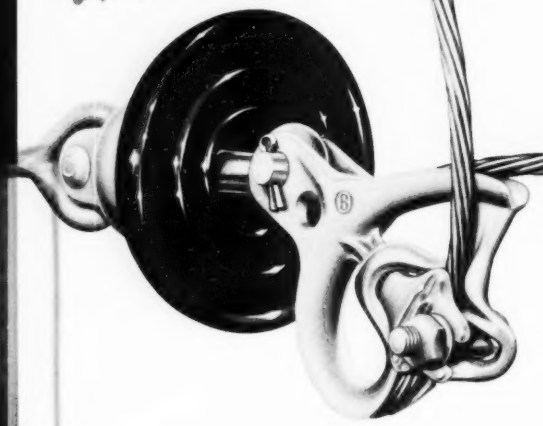


Typical section of right-of-way viewed from a point partly up the slope of Great North Mountain. Rock conditions produce high ground resistance that complicates attaining the operating standard set for this line.

Ohio Brass

MANSFIELD, OHIO, U. S. A.

Don't miss this trend



...IN CITY DISTRIBUTION PRACTICE!

RESIDENTIAL power demands are up 82 per cent from ten years ago, and some men in the industry look for an additional 300 per cent by 1960. City primary distribution systems must stretch to accommodate this demand, and the only answer is higher voltage. Many properties have now taken this step and many more are getting ready.

While some parts of the previous low voltage distribution network can be retained, the conversion to higher voltage requires a type of deadend better adapted to the service. From all standpoints, including the experience of present users, the best high voltage primary deadend is built with six-inch suspension insulator units.

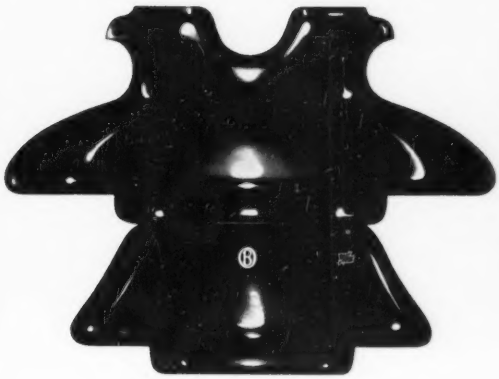
If you prepare now for increased voltage by building all primary deadends in this fashion, you will have the benefit of excellent deadending at present voltages and will save the duplication in cost involved in rebuilding at a later time. With this financial saving also goes a big saving in time when the cut-over is made, and a reduction of the hazard of rebuilding in crowded pole top locations.

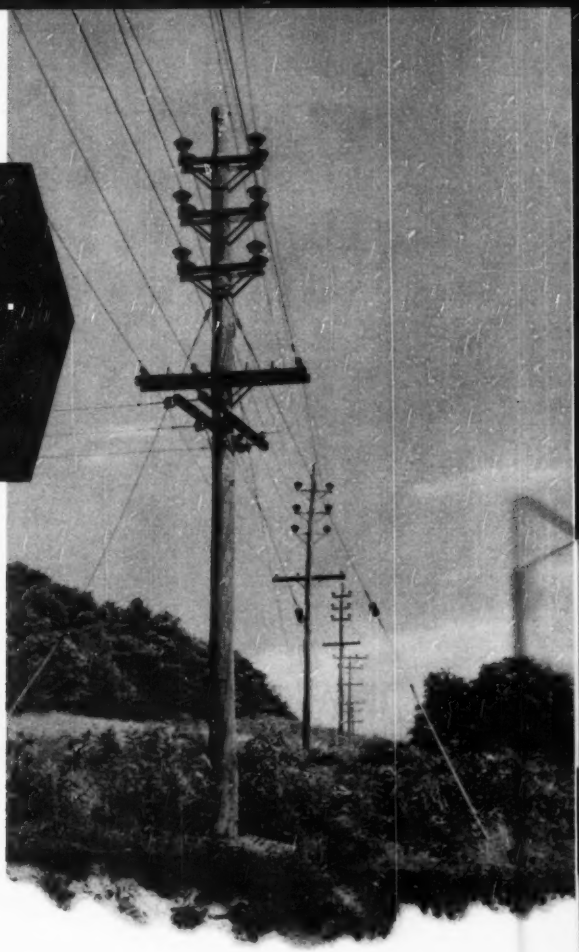
O-B six-inch suspension insulators give you a mechanical strength of 10,000 pounds plus electrical values adequate for elevated voltages--and at the lowest cost for this suitable combination. They can be purchased as needed from your local Graybar warehouse, which adds another saving by eliminating the cost of private stock handling.

It all adds up to this--building your present primary deadends with O-B six-inch suspension units, obtained through Graybar, is a smart, dollar-wise move today.

HI-TENSION NEWS *Junior*

One of the cheapest parts of a power line... *MOST of the time!*





Very few investments can increase in value as fast as an insulator. You may buy an ordinary pintype for a dollar or two that, in a millionth part of a second, can cost you several hundred!

Few parts of a line, even the pole holes, are as cheap as the insulators. Yet lightning can make an insulator outrageously expensive when you add up patrolling for trouble, line truck cost, wages of ground crews, linemen, and drivers, and the loss of line revenue. Put your own value on the public good will involved--all for an insulator that *need not* have failed if lightning had been included in its basic design assumptions.

Pintype insulators operating on unshielded lines are sure to sustain flashover as a result of lightning, but they can be made to resist damage until this electrical stress is relieved by breakdown of the surrounding air path. This is not a common characteristic of *all* pintypes. Years of testing, research, redesign, and retesting in the insulator industry's greatest laboratory are behind modern O-B units that can be trusted to survive the shock of lightning voltages.

If you want pintype insulators to *stay cheap* and your lines to *stay serviceable*, there's an easy answer--specify O-B. It will help you sleep on a stormy night!

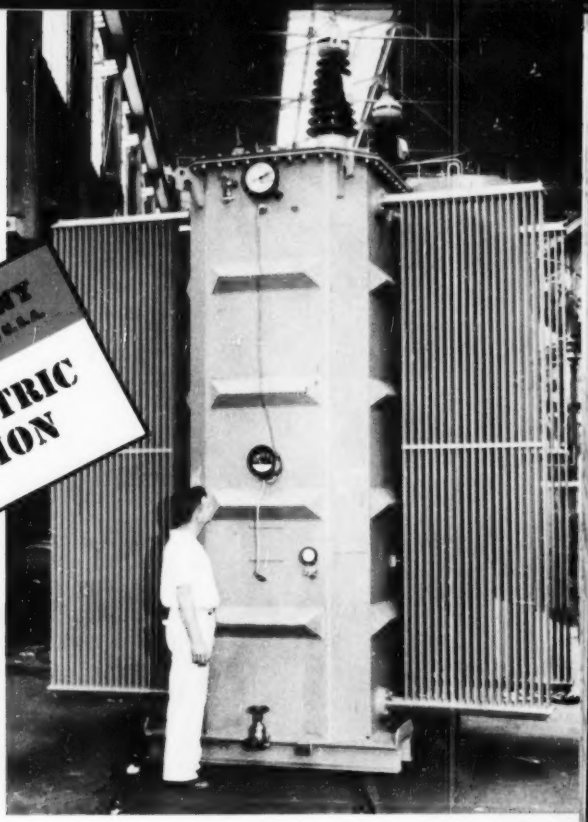
Ohio Brass

MANSFIELD, OHIO, U. S. A.

HI-TENSION NEWS
Junior

OHIO BRASS COMPANY
BARBERTON DIVISION • BARBERTON, OHIO, U. S. A.

WAGNER ELECTRIC CORPORATION



One of a bank of four Wagner transformers now going into service and, like many other Wagner units, equipped with O-B bushings as another step toward highest reliability. Size and general makeup of these transformers are indicated by a few specifications supplied by the Wagner Electric Corporation: "Each unit rated at 5,000 kva, single phase, 60 cycle, 39,850/69,000 Y to 12,000 volts. Oil filled, self cooled, and equipped with vertical inert gas oil seal tank for oil preservation. Among other refinements are magnetic oil level indicators with alarm contacts to warn of low oil level, dial type oil temperature thermometers with alarm contacts, combination pressure and vacuum gauges . . ."

AND OB BUSHINGS

ONE OF THE FINEST COMPONENTS OF ANY TRANSFORMER

boom extended well above the tower. (2) Crane outriggers were blocked. (3) A ¾-in. steel cable bridle was placed in position below the braces of the middle crossarm and fastened to the hook of the cranes. (4) All of the slack was taken up until the crane had the load of the tower, insulators, and conductors. (5) All of the old splice bolts were removed. (6) The crane then picked the tower up about 4 ft. (6) Next the boom was raised, which put the bottom of the tower in position over the new extension. (7) Tower was bolted to new extension and guyed head and back. (8) Crane was then removed. (9) Conductors and ground wires were placed back in the clamps. (10) Crane was moved into position to raise next tower. Crane was grounded while work was in progress.

Water Cooling Increases Cable Capacity

A. BODICKY
Underground Engineer
The Union Electric Co of Missouri
St. Louis

To increase cable capacities The Union Electric Co of Missouri has developed three methods of cooling cables with water. They are:

1. Tap city water main and run 1 gpm of water through one of the middle ducts occupied by a heavily loaded cable.

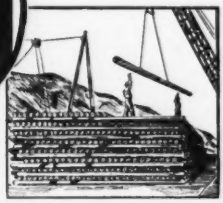
2. Cooling of 6-750,000 cm single conductor 66-kv cables is accomplished by running water through the top two ducts from a manhole located on top of a hill and allowing the next lower manholes to fill with water. Water continues through the bottom ducts cascading to manholes at the bottom of the slope. More water is required but only 15 water connections are needed in an eight-mile run.

3. At the Cahokia Plant two parallel 12-kv cables run under a coal pile. These are water-cooled by using plant river water connected to each duct, flooding the manhole, and continuing the flow through the bottom ducts to the next manhole to a drain. Once a year sediments are washed out with a fire hose.

Thus far no adverse effect or corrosion has been noted on any cables.

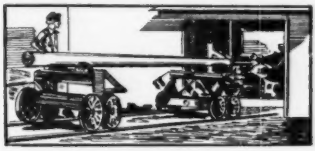
BAXCO
LONG-LIFE
DOUGLAS FIR
PRESSURE TREATED
LONG POLES

For over 50 years J. H. Baxter & Co. with its Associated Pacific Coast Companies has specialized in the production and sale of exceptionally long (up to 125 feet) Wood Poles for the electric power, lighting and telephone utilities . . . Stocks in all lengths are complete — shipments prompt!



PROPER SEASONING

BAXCO poles are carefully seasoned in dry, clean yards. Proper pre-conditioning before Pressure Treatment adds years of longer life.

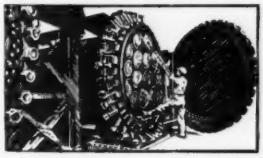


MACHINE SHAVING

To produce smoother and more uniform poles, the BAXCO process includes machine shaving. This removes small swells and results in a more round, evenly tapered product.

PRESSURE TREATMENT

Deep penetration and high retention of the preservative is a hallmark of the BAXCO Pressure Treatment Method.



Get the Full Story! Write today for this BAXCO BOOKLET

J.H.Baxter & Co.
333 MONTGOMERY STREET · SAN FRANCISCO 4, CALIFORNIA

ASSOCIATED COMPANY: J. H. BAXTER & CO. OF OREGON

LOAD BUILDING

Better Street Lighting for Better Business

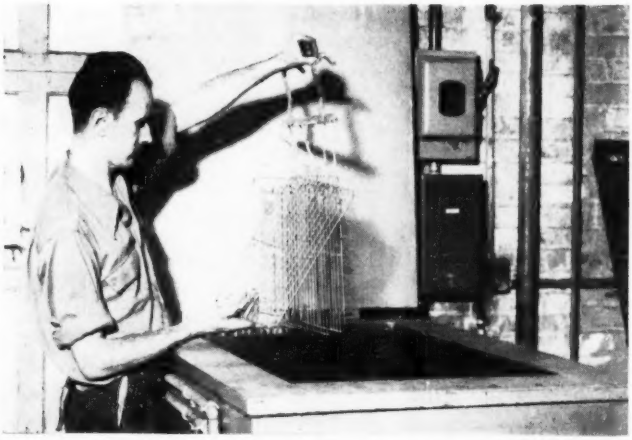
IMPROVED APPEARANCE of Sugar House business district of Salt Lake City due to new high intensity (1¾ ft-c) street lighting gave night business a substantial boost. Project was initiated and put through the City Commission by the local Chamber of Commerce

INSTALLATION of a high intensity street lighting system has helped increase night business as much as 70%, according to merchants in an outlying business area of Salt Lake City. Street illumination of approximately 1¾ ft-c and resulting increased traffic safety have proven attractive to potential customers.

The system consists of 142 steel poles spaced opposite each other approximately 100 ft apart along both sides of the street. Six-foot upsweep brackets support a luminaire and 15,000-lm lamp approximately 30 ft above the pavement.

In line with efforts of the local merchants to make the area as attractive as possible, Utah Power and Light changed their distribution system to the rear of the buildings.

Electrically Heated Tank Saves Tin and Time



OIL BATH, heated by 22 kw in thermostatically controlled electric strip units, is used for "flowing" the tin to give a smooth, nonporous surface on articles plated electrolytically

AN ELECTRICALLY heated oil bath provides a means of imparting a smooth finish to electrolytic tin plate. The installation at Gilbert Cummins Co, Baltimore, Md., is reported to effect a substantial metal saving over the "hot dip" method.

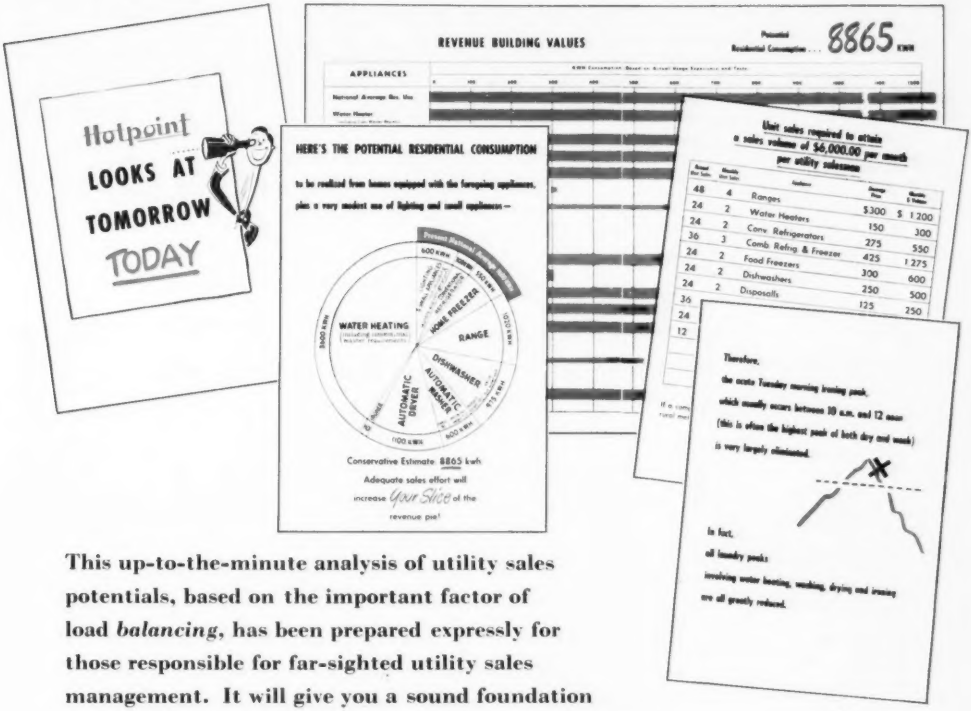
The tank was designed by L. E. Clements Engineering Co, Baltimore. It holds high-flash-point oil and is heated by 22 kw in electric strip units controlled thermostatically. Taps permit two-level drainage for easy removal of sludge and reconditioning of oil. A heat of 450 F is used in tin fusing. At that temperature the electrolytically deposited metal "flows" to form a nonporous surface.

The process is used chiefly in plating food handling equipment such as milk cooling coils and refrigerator shelves. Results given by Mr. Cum-

"Every utility sales executive in the country should see this new study of balanced load building possibilities"

Fred A. Compton
Vice President in charge of Sales
Detroit Edison Company

. . . and we'll be glad to show it to them, Mr. Compton


Hotpoint
LOOKS AT
TOMORROW
TODAY
REVENUE BUILDING VALUES
APPLIANCES
8865 KWH
HERE'S THE POTENTIAL RESIDENTIAL CONSUMPTION
to be realized from homes equipped with the foregoing appliances, plus a very modest use of lighting and small appliances—
WATER HEATING
HOME FREEZER
RANGE
DISHWASHER
AUTOMATIC WASHER
AUTOMATIC DRYER
Conservative Estimate 8865 kwh
Adequate sales effort will increase Your Slice of the revenue pie!
Unit sales required to attain a sales volume of $6,000.00 per month per utility salesman
Ranges $300 $ 1200
Water Heaters 150 300
Conv. Refrigerators 275 550
Comb. Refrig & Freezer 425 1275
Food Freezers 300 600
Dishwashers 250 500
Disposalls 125 250
Therefore,
the acute Tuesday morning ironing peak,
which usually occurs between 10 a.m. and 12 noon
(this is often the highest peak of both day and week)
is very largely eliminated.
In fact,
all laundry peaks
involving water heating, washing, drying and ironing
are all greatly reduced.

This up-to-the-minute analysis of utility sales potentials, based on the important factor of load *balancing*, has been prepared expressly for those responsible for far-sighted utility sales management. It will give you a sound foundation for a constructive sales program for 1950 . . . a program that will also please the dealers in your territory and stimulate their cooperation.

Hotpoint

Just get in touch with *The Hotpoint Committee on Cooperation with Utility Executives, Hotpoint Inc., 5600 W. Taylor Street, Chicago 44, Illinois.*

mins are: (1) Only 30 sec to 1 min is required for the tin to flow; (2) rapid recovery with electric heat makes it possible to treat heavy loads; and (3) several hundred pounds of tinplate can be finished in less than an hour.

Single Unit Range And Water Heater

"A NEW COOKER which not only supplies bath and household hot water but provides steam for cooking and a supply of boiling water on tap for tea making has been designed by Mr. W. A. Gillott to provide a complete domestic service in one unit. A new house in which this cooker is to be installed can be built without a kitchen chimney and needs no solid fuel boiler and hot water tank—and it can also dispense with an electric kettle. In a house where a solid fuel hot water system is already installed, the Gillott can be connected to serve as an auxiliary water heater. . ."

So begins a news release from the Glover-Pethick Industrial News Service, Bristol, England, announcing the new appliance illustrated above. The water heater is 20 gal capacity, storage type with a 750-w top, and a 2,000-w bottom, element. Water temperature is maintained at 160 F by thermostat and 3-position switch control. The "low" position controls the top element and provides about 8 gal of water for ordinary kitchen use. A booster tank with a 1,350-w heater furnishes steam for cooking. The appliance includes a 2,400-w oven, a surface-cooking unit and a broiler.

Stairway of Light

Westinghouse Electric Corp

ILLUMINATED SIDES on escalators recently installed in the Flushing, L. I., branch of Bloomingdale's, a New York department store, are said to be the first in this lighting application. Behind the tempered glass that lines the inside of the balustrades are T-6 slimline fluorescent tubes. Each stairway is 32 in. wide, capable of moving 5,000 persons per hr

Standing Up in Service

Fluorescent Lighting Association

LESS than 1% replacement in two years is stated for 67 installations of these hairpin type cold-cathode lamps in Detroit schools. In a standard classroom 22 x 30 ft, 12-ft ceiling, are installed six fixtures at existing outlets. Each fixture contains four lamps each of 2,400 lm, and, including ballast, is rated at 212 w. Maintained intensity averages 30 ft-c

GENERAL ELECTRIC'S '49-'50 SUN AND HEAT LAMP PROMOTION

SHOPPER STOPPERS! General Electric Lamp agents everywhere are getting G.E.'s new sun and heat lamp display kit. It'll help make attractive attention-getting displays that will sell more lamps—help build more load. And the idea sheet inside will help land many a 250-watt sale!

G-E REFLECTOR SUNLAMP Tans like the summer sun. Becoming more popular every year... now only $8.50

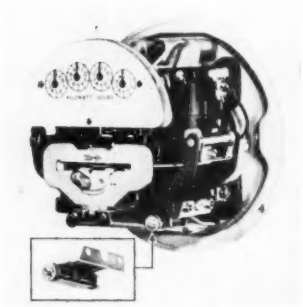
G-E INFRA-RED HEAT LAMPS Soothe muscular aches and pains. Hardglass model with red filter... $2.95 Standard model... $1.10

STOCK UP NOW!

NATIONAL ADVERTISING Colorful ads in LIFE and SATURDAY EVENING POST will pre-sell the winter-weather benefits of load-building General Electric Sunlamps and Heat lamps during General Electric's big Sun and Heat lamp campaign!

GENERAL ELECTRIC

NEW EQUIPMENT



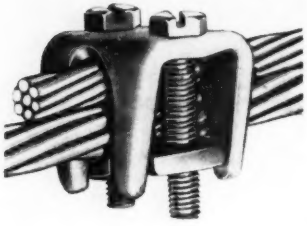
Polyphase Watthour Meter

A MICROMETER adjustment for power factor compensation has been incorporated in the design of Type LC polyphase watthour meters. Inset in the illustration shows the adjuster, which is comprised of a slide wire held in compressive contact with a slider mounted on a threaded shaft. Position of the slider on the shaft, which fixes the compensation, is adjusted by rotating the shaft with a screw driver. Shaft is accessible from the front in both 2- and 3-element Type LC meters.

Photoelectric testing in permitted by another change in design. A vertical, clear path for the light beam is provided by a circular hole 0.07 in. diam near the edge of the disk.

Sangamo Electric Co, Converse and Burton Sts, Springfield, Ill.

•



Two-Bolt Connector

CONNECTIONS on conductors as small as No. 6 solid wire is made possible by a two-bolt clamp connecting device. Advantages claimed for the 642 Uniclamp include easy installation and tightening with a screw driver or 6-in. wrench. When installed, a locking effect is created between the riding bar and two Duronze bolts.

Connector is said to be cold forged from 99.6% conductivity copper. It is available with or without spacer bars and is applicable to the making of copper to copper, copper to aluminum, and aluminum to aluminum connections.

W. N. Matthews Corp, 3850 Delor St, St. Louis, Mo.

•

Double Cathode F Lamp

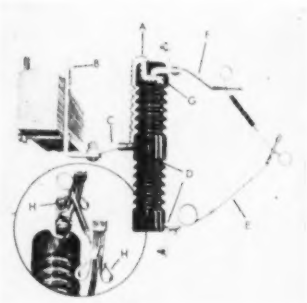
TEN THOUSAND user hours is the life rating of the DXC double cathode fluorescent lamp. The extended life rating is said to be possible because the current splits between the two cathodes

so that wear of the emission coating on each electrode is about one-half that found in a single cathode lamp. Illustration is that of a test model with uncoated glass tube.

It is claimed that use of a new berryllium-free fluorescent powder has resulted in a brighter lamp; for example, 3,500-deg White lamp has been increased from a rating of 2,320 lm to 2,480 lm.

The lamp is said to operate on auxiliary equipment with standard fluorescent fixtures, and is supplied in standard colors. More positive starting is also reported.

Duro-Test Corp, 4161 Boulevard, North Bergen, N. J.



Open Link Cutout

A NEW OPEN LINK cutout is being made in ratings of 7,500 and 15,000 v, 50 amp, for circuits through 13,800 v. Greater leakage and flashover distances (A on illustration) are obtained by recessing the end inserts (shown at G and in cutaway). This distance is also increased by cementing-in and locating all inserts (D) so that live parts are on opposite side of insulator from the adjustable mounting bracket (C). This is said to render the unit animal and bird-proof.

Wedge-type contacts (H) with long uniform grooves are said to give a high pressure grip on the fuse link cable, and preclude radio interference. Flexibility and ease of installation is stated to be provided by the NEMA standard crossarm hanger (B) together with the adjustable mounting bracket.

Lower and upper contact arms are indicated at E and F. Full details appear in Catalog Section 530.

S & C Electric Co, 4421 Ravenswood Ave, Chicago 40, Ill.

•

Safety Strap

MULTIPLE PLIES of nylon are laid together in neoprene and vulcanized in the construction of a safety belt said to be three times stronger than harness leather. Extra long life is claimed because the nylon is impervious to any

Have you seen

THE NEW

Street Lighting Brackets

The Hubbard Round Brace Type is a graceful, one piece Bracket in which the ¾-inch diameter brace is welded to the bracket at its contact points, giving the arm unusually high strength. One piece design permits fast, efficient mounting.

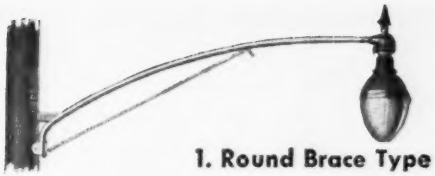
The Hubbard Tie Rod Type is a strong, rigidly supported Mast Arm made from 1¼-inch nominal Diameter Pipe. ⅜-inch diameter tie rods allow for adjustment of the arm as well as adding strength to the assembly.

Hubbard Truss Type Mast Arms are formed by welding heavy angle steel and truss plates to 1¼-inch pipe. Tie rods increase the assembly strength and permit adjustments to be made after mounting.

The Hubbard Municipal Type Bracket is our most popular design for Urban Areas. It is used for externally wired systems on both wood and steel poles. Municipal Brackets are easily installed by one man. The clean, modern appearance of the Municipal Type is always pleasing.

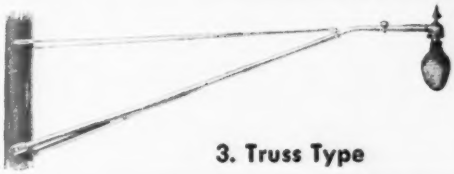
The Hubbard Universal Type Bracket is the outstanding development in the manufacture of street lighting brackets in recent years. May be used for external or internal wiring on steel poles and for external wiring on wood poles. No scroll or brace is needed because of the great strength of this design.

Hubbard Parkway Brackets are designed for internally wired steel poles. They may be mounted singly, as shown, or back to back. Brackets of this type are well adapted to modern roadway design. The rugged simplicity of their assembly reduces maintenance to a minimum.



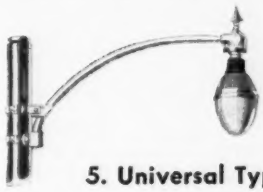
1. Round Brace Type

2. Tie Rod Type



3. Truss Type

4. Municipal Type



5. Universal Type

6. Parkway Type

All welded construction throughout
Requires small pole mounting space
Meet all EEI-NEMA lighting specifications
"Keyhole," basic feature of pole attachment, permits installation by one man
Simplicity of design means low cost
Permanently aligned at factory
These and other outstanding improvements found only in Hubbard Brackets and Mast Arms, covered by patents pending

HUBBARD AND COMPANY

PITTSBURGH
CHICAGO

OAKLAND
CALIFORNIA

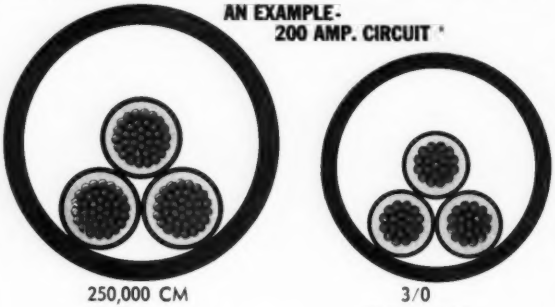
HUBBARD and Company, Advertising Dept. SL-2
6301 Butler Street, Pittsburgh 1, Pa.

Please send, to my attention, literature describing in detail the new line of Hubbard Street Lighting Brackets.

Name .....
Company .....
Title .....
City ..... State .....

MAKE SAVINGS WITH
CRESCENT
ENDURITE
Type RH
CABLES FOR FEEDERS
Gives Greater Current Carrying Capacity per Dollar of Installed Cost

AN EXAMPLE-
200 AMP. CIRCUIT *



250,000 CM
TYPE R

Requires 2½" Conduit. Maximum permissible operating temperature 60° C.

3/0
TYPE RH

Requires 2" Conduit. Maximum permissible operating temperature 75° C.

The superior heat resistant characteristics of CRESCENT ENDURITE INSULATION with its higher permissible operating temperature and therefore greater current carrying capacity, permits the use of a smaller size of conductor, and in most cases smaller size of conduit at less cost than would be required for Type R Wire for the same load.

For light loads requiring small sized conductors, Voltage Drop is the determining factor in choice of wire size. Usually in sizes No. 6 AWG and heavier for power circuits or No. 1 AWG and heavier for lighting circuits, CRESCENT ENDURITE Type RH Wire & Cable gives the lowest installed cost-per-ampere of useful circuit capacity.

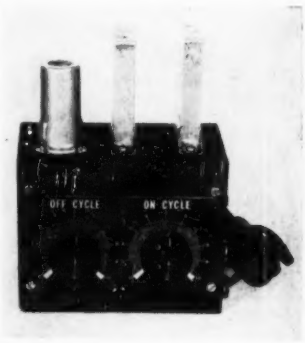
In Accordance With 1947 National Electrical Code

CRESCENT
WIRE and CABLE
OVER 60 YEARS EXPERIENCE
CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, NEW JERSEY

substance with which it might come into contact, and flexibility is retained even at low temperatures.

Buckingham Manufacturing Co, Inc, Binghamton, N. Y.

•



Electronic Timer

SINGLE INTERVAL operation with manual initation, or repeat cycle timing with two adjustable intervals occurring successively without external operation, can be secured with the "Cycle-Flex" electronic timer. Each interval is accompanied by relay contact closure, the contact being the only moving part.

In addition to use as a repeat cycle timer, manufacturer reports that the timer finds application in electroplating, life testing, temperature control, heat sealing and refluxing. It has arbitrary "on" and "off" intervals of 0.5-3 sec and

MORE NEW EQUIPMENT

Just Received

Appearing Next Issue

1-PH WATTHOUR METER
All four major assemblies are unit constructed

OVERCURRENT RELAY
Approximates inverse time characteristic of power fuse

CLASS B INSULATION
Resin reduces penetration of adhesive coating

A-C MOTOR STARTERS
Standardized wiring and mounting simplify maintainence

WELDING CONTROLS
Only moving parts are initiation and solenoid relays

VOLTAGE REGULATOR
Eight-step regulator has "load-bonus" feature

VERTICAL-MOUNTED MOTOR
Integrated a-c motor and fingertip speed control unit

PORTABLE PYROMETER
Wide selection of interchangeable thermocouples

"penta- chlorophenol means clean positive protection!"

Shrewd light and power men specify PENTAchlorophenol for poles and cross arms. Here are some of the reasons why:

1. "PENTA" is a preservative of proved effectiveness.
2. "PENTA" is stable and uniform—allows measured and permanent protection.
3. "PENTA" is a nonconductor—creates no special problems.
4. "PENTA" is economical to use—helps reduce maintenance costs.
5. The "PENTA" treatment is a clean treatment . . . Linemen prefer it!

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

DOW
penta-
chlorophenol

LET OUR CUSTOMERS* TELL YOU WHY THEY USE the CHANCE 8-way Anchor

"easier to expand"
"easier to spread in hard earth"
"LESS LOSS FROM DAMAGE"
"... they withstand additional strain ..."
"WE LIKE THE 8-WAY"
"less effort spent in spreading"
"our men like to use the 8-way better than any other"

*Names on request.

Yes... the Chance 8-way Anchor gives you better anchoring for less money. Greater load distribution, due to the cone shape and the close proximity of the blades, makes this new anchor more powerful than other types of expanding anchors. Simplified construction makes the 8-way easier to expand and more applicable to varied soil conditions. This simplicity also saves on manufacturing costs—and this saving is passed on to you!

Investigate the Chance 8-way Anchor—you'll agree with others—"It's the best buy on the market."

You know it's RIGHT when you specify CHANCE

C 499

A·B·CHANCE CO·

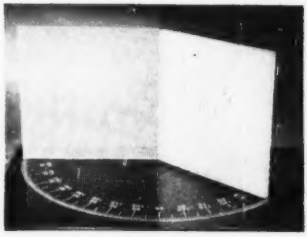
CENTRALIA, MISSOURI · SAN FRANCISCO, CALIFORNIA

ABC INDUSTRIES

9–20 sec, respectively, and uses a spdt relay with contacts rated at 3 amp, 115 v a-c. Timer operates from 110–125 v, 60 cycles, using one vacuum tube.

G. C. Wilson & Co, 2 N. Passaic Ave, Chatham, N. J.

•



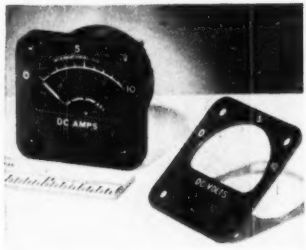
Lighting Material

A NEW FORM of louver lighting material, called Fota-lite, allows direct illumination to pass through while blocking direct light angling to the side. Manufactured as a thin pane of transparent glass, it is engrained throughout its length and depth, by means of a photographic process, with white opalescent vanes in a symmetrical, criss-cross pattern.

Fota-lite can be cut to size that the louvers are a part of the glass. The translucence of the louvers creates a diffusion of indirect light at side angles. Thus glare is eliminated, as in the illustration, due to the 45-deg light cut-off characteristic of the material.

Corning Glass Works, 1946 Crystal St, Corning, N. Y.

•



Panel Meter

ONE BASIC PANEL meter can be used for several ranges by changing the face plate and adding external accessories. The d-c self-contained instrument is adaptable to ranges from 50 to 500 μa, 1 to 500 ma, and from 1 to 15 amp. Included in the range are 25 to 1,000 mv, and the self-contained unit will register 1 to 500 v, as an a-c meter of the rectifier type range is also 1 to 500 v. Higher ranges are obtainable by adding external resistors.

there are 6 good reasons for using MULTI-BREAKERS to build bigger, better, more profitable wiring jobs!

Reason #5 . . . PROTECT YOUR PROFITS!

Who knows it better than the electrical contractor—when a bunch of price-cutters start sharpening their pencils, there's no bottom. No profit, either.

These price-cutting boys aren't much interested in Multi-breakers and the better, more profitable wiring jobs that go with them. But thousands of aggressive electrical contractors who sell quality jobs on the basis of more customer protection and convenience, are out-selling the "price" operators, hands down.

Actually, Multi-breaker wiring jobs are easier to sell . . . and they stay sold because they're right. They're emphatically right from the Utilities standpoint . . . because they reduce costly service calls and build a lot of valuable customer good will.

Would you like to know the five other reasons—as we're presenting them to electrical contractors throughout the country? Write the Square D Company, 6060 Rivard St., Detroit 11, Michigan. We'll mail them, pronto.

SQUARE D's Thermal-Coilless Magnetic MULTI-BREAKERS

Give Complete Circuit Protection and Customer Satisfaction

. . . because they

—hold harmless momentary overloads but trip on continuous overcurrents before wire insulation is damaged.
—trip quickly on "shorts" to localize damage.
—give repeat protection. No parts burn out—nothing to replace.
—are non-tamperable. Factory test-tripped and sealed.
—are safe. No live parts exposed. Anyone can operate them.
—include switching means as well as circuit protection.
—are compact. Room for expansion without excessive space.
—are attractive. Can be installed in most convenient location.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

NO VARNISH needed on these wrappings. Four layers of thin, tough "SCOTCH" No. 33 Electrical Tape provide ample insulation for these four stress cones in a Chicago, Illinois, Pumping Station. Two cones in rear carry 12,000 volts; the two cones in foreground carry 2,300 volts.

New plastic tape gives "3-in-1" insulation protection

Cost-wise electricians and contractors like Monroe Electric Co., Chicago, are finding that "SCOTCH" No. 33 Electrical Tape does the work of three conventional insulating materials. Thin caliper plus high dielectric strength make this tough tape ideal for almost any kind of insulating job.

Try "SCOTCH" No. 33 Electrical Tape the next time you re-wire or install equipment. It takes little room on "tight spot" insulation, resists acids, alkalies, water and oil, lasts for years under severe weathering and aging conditions. Available in the 20 ft. by ¾ inch "Job Size" roll, packed 12 rolls to a tube, and the 66 ft. by ¾ inch "Economy Roll" packed in individual cans. Your electrical jobber has it.

FREE! tape sample and information on how "SCOTCH" Electrical Tapes can save you money, give you better insulation *faster*. Write Dept. EW-9 today. No obligation.

Quick Facts About "SCOTCH" No. 33 Electrical Tape

- **THIN CALIPER**—only .007 in. thick, takes less room in junction boxes and fittings.
- **HIGH DIELECTRIC STRENGTH**—over 7,000 volts.
- **TOUGH**—plastic backing is abrasion resistant, unaffected by water, acids, alkalies, alcohols, and oil.
- **STRETCHY**—conforms snugly to uneven surfaces, odd shapes.
- **P.S.** For high-heat insulation use "SCOTCH" Electrical Tape No. 27 with glass cloth backing—thermo-setting adhesive.

ANOTHER 3M COMPANY PRODUCT

Made in U. S. A. by MINNESOTA MINING & MFG. CO., Saint Paul 6, Minn.

also makers of other "SCOTCH" Pressure-Sensitive Tapes, "UNDERSEAL" Rubberized Coating, "SCOTCHLITE" Reflective Sheeting, "SAFETY-WALK" Non-Slip Surfacing, "3M" Abrasives, "3M" Adhesives.

General Export: DUREX ABRASIVES CORP., *240 North Ave., New Rochelle, N. Y.*
In Canada: CANADIAN DUREX ABRASIVES LTD., *Brantford, Ontario*

Accuracy is claimed to be 2% of full scale for d-c operation and 5% when used as an a-c instrument. Meter can be supplied with either a watertight or hermetic seal, shielded or unshielded.

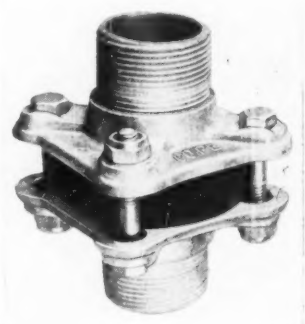
International Instruments Inc, 331 East St, New Haven 11, Conn.

•

LADDER EQUALIZER—Interconnected hydraulic units of the "Hydra-lizer" automatically displace oil from one leg into the other as ladders are erected to correct balance for uneven ground conditions. The steel ladder attachment is designed for public utilities, industrial ladder users, and other maintenance work to handle working loads of over 500 lb. Ladder can be locked in any position with a foot-operated valve lever.

ANDERSON PRODUCTS CO. P. O. Box 691, TULARE, CALIF.

•



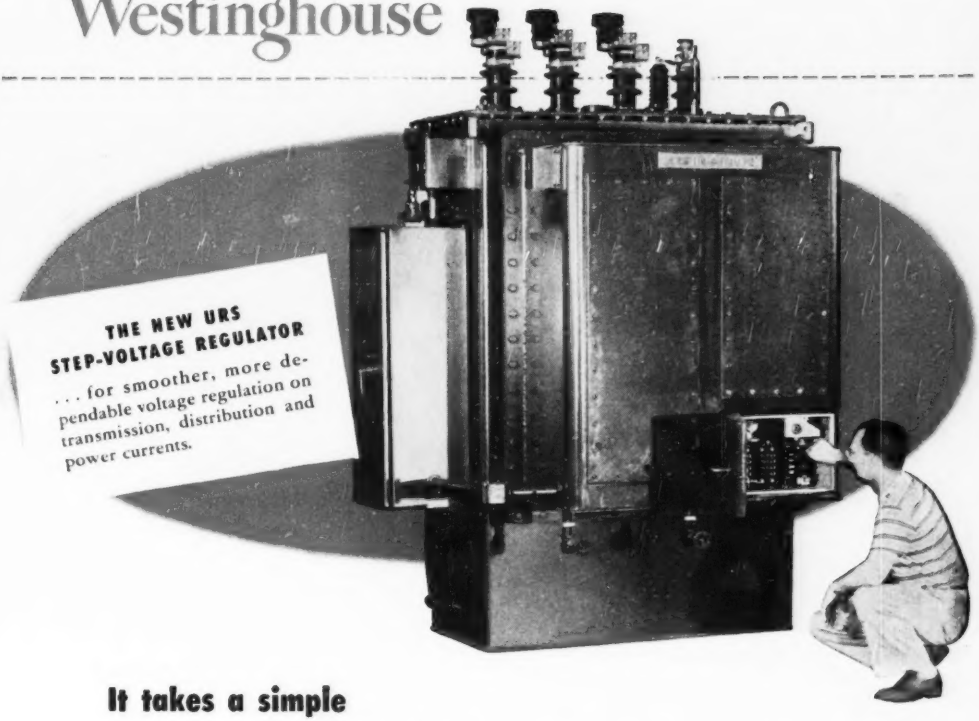
Street Light "Levelizer"

A UNIT CALLED the "Levelizer" is used between the street lighting bracket and luminaire to adjust the position of the luminaire. Luminaire can be brought into a direct horizontal line even though the bracket may be off plumb.

Unit measures 3x3x2 in. and con-

YOU CAN BE SURE.. IF IT'S

Westinghouse


THE NEW URS
STEP-VOLTAGE REGULATOR
. . . for smoother, more dependable voltage regulation on transmission, distribution and power currents.

It takes a simple

Direct Drive

for Lasting Dependability

Help increase the efficiency of your customers' electrical apparatus. Realize greater customer satisfaction *and* increased revenue! Give them economical, dependable voltage regulation with the new URS Step-Voltage Regulator . . . equipment you can count on for:

Lasting Dependability—because URS Tap-Changer provides *positive action*. The unusual simplicity of the direct-connected drive reduces potential trouble sources to a minimum.

Minimum Wear—because high contact speeds and contact tips of special arc-resistant alloys minimize erosion due to arcing.

Minimum Care—because wearing parts are carefully designed for longer life. All parts are readily accessible. The Tap-Changer may be inspected by removing conveniently located inspection plates.

There's a Westinghouse voltage regulator to meet every requirement. Get the complete story. Write for B-4245, C.S. 47-225, D.B. 47-310 and D.B. 47-410. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70531

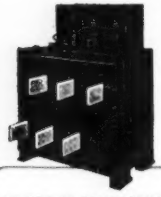
Westinghouse

VOLTAGE REGULATORS FOR *ANY* SYSTEM

NEW AIR-COOLED
DISTRIBUTION TRANSFORMERS

POLE MOUNTED
OUTDOOR — ALL-PURPOSE — INDOOR
WALL MOUNTED

MARCUS SCORES AGAIN IN THE FIELD OF AIR COOLED TRANSFORMERS



AIR-COOLED TRANSFORMERS
1 to 2,000 KVA up to 15,000 Volts to meet Individual Requirements

- DISTRIBUTION
- GENERAL PURPOSE
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING

MTC

From a Pioneer in the field comes a new distribution transformer—AIR COOLED, DRY TYPE. No hazardous oil or toxic liquids to fuss or bother with. The use of superior class B and C heatproof insulation such as fibre-glass, mica, porcelain, new Johns-Manville Quinterra and similar inorganic material results in a transformer that can withstand the overloads that normally would damage an ordinary class A (cotton and paper) insulated oil filled unit. The entire transformer element is seal protected against oil, acids, moisture, etc., and is housed in a sturdy, scientifically ventilated, weatherproof case which conforms with all applicable EEI-NEMA construction standards. This extremely versatile transformer can be used outdoors, pole or platform mounted or indoors at the load center, mounted wherever convenient with no expensive fireproof vault required.

Currently available in sizes to 100 KVA, voltages to 5000 V.

COMPETITIVE PRICES • GOOD DELIVERIES
WRITE FOR BULLETIN #49-ACO

MARCUS TRANSFORMER CO.
INC.
30 MONTGOMERY STREET
HILLSIDE 5, NEW JERSEY

PIONEERS IN THE FIELD OF AIR-COOLED TRANSFORMERS

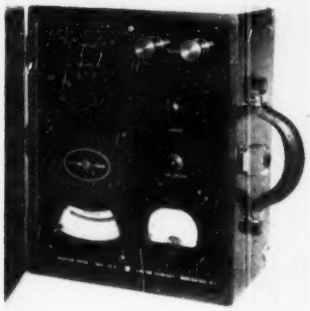
Representatives in Principal Cities

MARCUS TRANSFORMERS CONFORM TO THE STANDARDS OF N.E.M.A. AND A.I.E.E.

sists of two malleable iron flanges separated by a resilient Neoprene gasket. Actual adjustment is secured by use of four bolts with locknuts.

T. J. Cope Inc, 711 S. 50th St, Philadelphia 43, Pa.

•



"Microhm" Meter

CHECKING LOW RESISTANCE values in circuit breaker contacts, cable joints, bus bar connections, limiters and windings can be accomplished with the Model 151-S Microhm meter. The instrument is provided with an internal shield to protect against stray field effects, self-contained dry cells, and 20-ft leads.

Microhm ranges are 0-75; 0-750; 0-7,500 and 0-750,000 microhms. Case dimensions, 8x10x6 in.; weight, 18 lb.

J. W. Dice Co, Englewood, N. J.

•

Adjustable-Speed Drive

SPEEDS of fractional horsepower d-c motors, ranging from $\frac{1}{8}$ to $\frac{1}{2}$ hp and operated from 50/60-cycle, 220/440-v sources, can be controlled with the "Mot-o-trol" electronic adjustable-speed drive. Armature control is used to make possible a speed range of 20 to 1 at constant torque. The drive provides dynamic braking, overload and low-voltage protection without need of separate field rheostats and linestarters.

Rectifier equipment for the d-c motor is enclosed in a wall-mounted NEMA Type 1 enclosure.

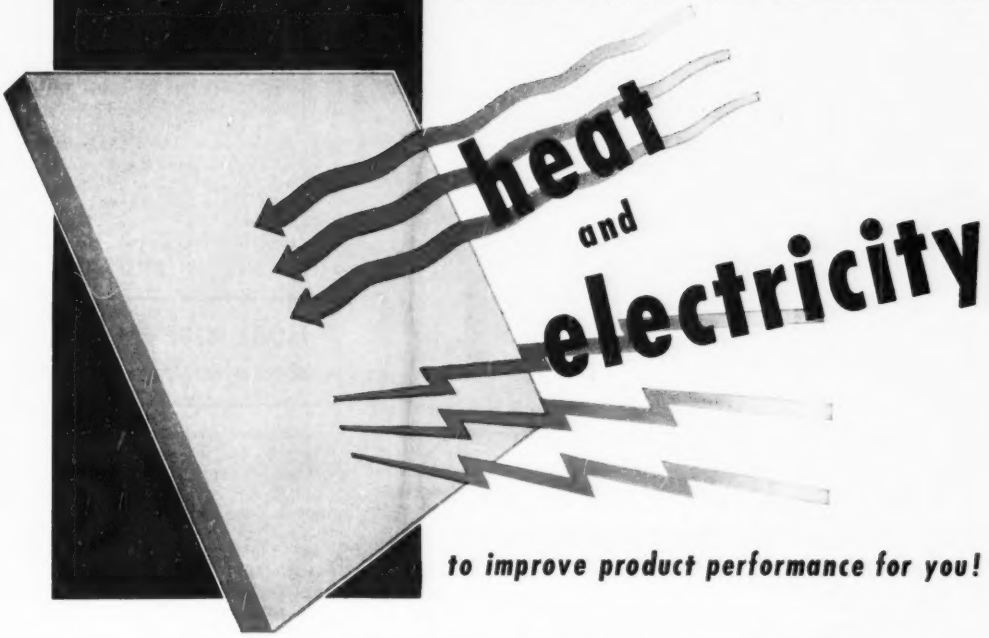
Westinghouse Electric Co, Box 868, Pittsburgh 30, Pa.

•

Ten-Cycle Amplifier

A HIGH-GAIN narrow band amplifier has been designed for operation wherever low-level 10-cycle voltage or current measurements are required. Model

NEW C-D Silicone Dilecto withstands an inferno of heat and electricity



to improve product performance for you!

There are three new grades of C-D Dilecto* that can withstand temperatures as high as 250°C. They are chemically inert, silicone-glass laminated plastics that offer exceptionally high heat resistance and good arc resistance, extra strength, and positive moisture resistance! At Continental-Diamond we've literally lived and worked with Silicone Dilecto—perfecting it to a point where we believe it can be highly useful in helping to solve your production problems — and improve product performance.

And this remarkable plastic is but one of many in the C-D family. They provide practical combinations of mechanical, electrical, and chemical properties—structural strength, light weight, positive moisture, heat and corrosion resistance. In hundreds of plants, C-D Plastics—Fibre, Vulcoid, Dilecto, Celoron, and Micabond—offer proof that it pays to see C-D first in your search for the right plastic for the job. For interesting, useful information on Silicone Dilecto, and other C-D high strength plastics, call or write your nearest C-D office, soon.

your partner in producing better products

*Dilecto GB—112—S
Dilecto GB—128—S
Dilecto GB—261—S

DE-2-49

BRANCH OFFICES: NEW YORK 17 • CLEVELAND 14 • CHICAGO 11 • SPARTANBURG, S. C. • SALES OFFICES IN PRINCIPAL CITIES
WEST COAST REPRESENTATIVE: MARWOOD LTD., SAN FRANCISCO 3 • IN CANADA: DIAMOND STATE FIBRE CO. OF CANADA, LTD., TORONTO 8

Continental-Diamond FIBRE COMPANY

Established 1895 . . Manufacturers of Laminated Plastics since 1911 — NEWARK 15 DELAWARE

BERMICO* FIBRE CONDUIT

BERMICO CONDUIT IS REALLY RUGGED—IT'S BUILT TO TAKE ROUGH HANDLING ON THE JOB.
ITS CLEAN, SMOOTH BORE MAKES PULLING CABLES THROUGH BERMICO FIBRE CONDUIT QUICK AND EASY.

distributed by
WESTINGHOUSE ELECTRIC SUPPLY COMPANY
Offices in all leading cities

BERMICO FIBRE CONDUIT—A PRODUCT OF BROWN COMPANY

33A is intended for use with photocells, thermistors, and other high-impedance devices, while the Model 33B is primarily for amplifying the output of low-impedance thermocouples and bolometers.

A 0–1 ma recorder of 1,500 ohms or less resistance can be connected into the circuit. Actual frequency can be adjusted over a range of about 2 cycles to obtain maximum response when signal being measured is not exactly 10 cycles. A calibrated attenuator permits the gain to be changed in steps by factors up to 1,000. Amplification to the rectifier bridge in the output in Model 33A is about 6×10^6, and about 6×10^5 (in a 20-ohm-circuit) in the Model 33B.

Electro-Mechanical Research Inc, Ridgefield, Conn.

MORE NEW PRODUCTS
about which you should know

American Steel & Iron Works, Chicago 21, Ill., is manufacturing Storack *channels* and fittings for supporting continuous or interval-spaced fluorescent lighting fixtures; Bulletin EW49 provides a full description. . . . **Gould Electric Supply Co, 2015 Jerome Ave, Bronx 53, N. Y.,** has a "*Fluor-o-lamp Tester*" for fluorescent tubes (14 to 40 w), starters (FS2, FS4, FS25) and incandescent lamps.

General Electric Co, Schenectady 5, N. Y., offers a weatherproof storage *container* for spare fuse links; it comes equipped with a bracket for pole mounting. . . . G. E. Co also announced a new line of lifetime oil-lubricated, shaded-pole *motors* for operation in any position; ratings from 1/40 through 1/12 hp, 115 or 230 v.

Centric Clutch Co, Cranford, N. J., has added a line of fractional and small hp *clutches* said to be highly adjustable although made as standard stock items; data in Bulletin 249. . . . **Eagle-Picher Co, Cincinnati 1, Ohio,** is marketing a fireproofing *cement* for application to steel; $1\frac{3}{4}$ in. layer is said to retard effects of a high heat for 3 hr.

Solar Electric Corp, Warren, Pa., has *spotlights* and floodlights available which provide light tinted for display purposes by means of two layers of glass. . . . **Unimatic Corp, 52 E. Centre St, Nutley, N. J.,** has designed the new Model 238T Harbot threaded 90-deg *connector* for $\frac{3}{8}$-in. armored cable.

Ideal Industries Inc, 1021 Park Ave, Sycamore, Ill., has a pocket-sized B-X *armor cutter* that cuts two or three No. 10, 12 or 14 B-X cable. . . . **W. H. Brady**

Co, 808 N Third St, Milwaukee 3, Wis., is making adhesive "Quick-Label" conduit and pipe *markers* for diameters of ¼ in. to 2 in., as well as over 2 in.

Keystone Mfg Co, Center Line, Mich., has added a *reducer bushing* to its line for connecting 6-in. wireway to a 4-in. size. . . . **Blackhawk Mfg Co, Milwaukee 1, Wis.** has developed a hollow-type *hydraulic ram*, RC-426, of 10-ton capacity for operation of new and existing knockout punches. Four new Porto-Power knock-out punch assortments have also been announced.

Barrett-Cravens Co, 4609 S. Western Blvd, Chicago 9, Ill., is making model MD hydraulic *lift truck* for handling loads up to 6,000 lb by one man. . . . **Farrelloy Co, 1233 N. 26th St, Philadelphia, Pa.,** is producing Farco *soldering salts* for mixing fluxes of any strength for use on steel, copper, iron, brass, and other common metals.

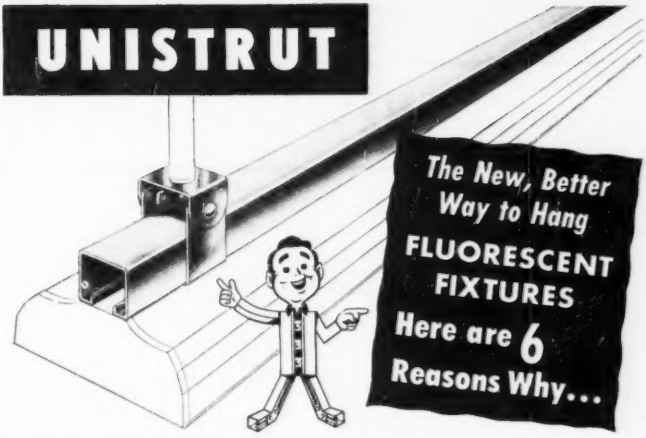
Gardner-Denver Co, Quincy, Ill., is offering a *sinker drill* in the 45-lb class, the S48, said to have drilling, rotating and hole cleaning characteristics that make it suitable for use with tungsten carbide rock bits. . . . **Yale & Towne Mfg Co, Philadelphia, Pa.,** has an attachment which equips its battery-powdered hand-truck line with hydraulically operated *fingers;* the fingers grasp and pick up drums and cylindrical containers without the use of pallets or skids.

Struthers-Dunn Inc., 150 N. 13th St., Philadelphia 7, Pa., has designed a new line of miniature *relays* for low-voltage d-c operation with contact arrangements up to 4-pole, double-throw; Bulletin 2610 describes them in detail. . . . **Independent Pneumatic Tool Co, 175 N. State St, Aurora, Ill.,** is manufacturing a portable electric belt *sander* for wood, metal, and stone; endless sanding belts are 4½ in. wide by 26 in. long.

Minerallac Electric Co., 25 N. Peoria St, Chicago, Ill., has announced a *beam clamp* that mounts hangers to I-beams without the necessity of drilling holes. . . . **Charles Bruning Co, Inc, 2754 W. Montrose Ave, Chicago 41, Ill.,** has added the Model 50 to its line of whiteprinter *reproducing machines;* has a capacity of 10,000 sq ft of prints per working day at variable speeds up to 24 fpm.

Executone Inc, 415 Lexington Ave, New York 17, N. Y., is marketing "Chime-Matic" *signaling equipment* as part of its intercommunicating stations; a call at the station is announced by means of a chime and signal light. . . . **Sciaky Bros Inc, 4915 W. 67th St, Chicago 38, Ill.,** is manufacturing a 100 kva resistance *welder* employing an automatic dial feeding mechanism to facilitate multi-part welding.

UNISTRUT



1 Fewer Hanger Stems and Canopies

Unistrut's great channel strength permits wider spacing of stems—up to 15 ft. apart if desired, but a better appearing installation and obvious savings.

2 Perfect Alignment

Unistrut channel is rigid, strong and perfectly straight—gives you true alignment of fixtures. Cleaning, re-lamping or other servicing cannot disturb this alignment.

3 Completely Flexible

Stems or rods can be installed at *any* point along Unistrut channel to overcome possible ceiling irregularities or obstructions. Ideal for continuous runs or intermittent spacing of fixtures.

4 Faster, Easier Installation

Unistrut channel and fittings are attached to fixtures quickly and easily at normal working height or at suspension level. No drilling, no welding, 100% adjustable.

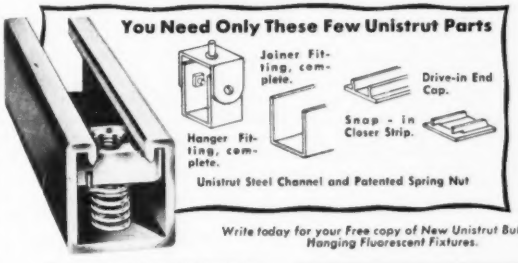
5 Added Safety

Unistrut assures the utmost safety of installation because an entire row of fixtures becomes a single integrated unit—added safety obtained by no other method.

6 Saves Time and Money

Reduces number of canopy and stem sets used, lowers wiring and rewiring costs, eliminates drilling and welding costs, saves planning and installation time.

Fully Tested and Proved by Contractors — on Thousands of Installations Demanding the Finest in Lighting!


You Need Only These Few Unistrut Parts
Joiner Fitting, complete.
Drive-in End Cap.
Snap - in Closer Strip.
Hanger Fitting, complete.
Unistrut Steel Channel and Patented Spring Nut
End View of Hanger Fitting Supporting Unistrut Channel

Write today for your Free copy of New Unistrut Bulletin on Hanging Fluorescent Fixtures.

U. S. PATENT NUMBERS

2327587	2345650	2380379
2329815	2363382	2405631

Representatives in Principal Cities

ALL PURPOSE UNISTRUT METAL FRAMING

UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd., Chicago 7, Ill.
DEPT. 83
Please send me your new Unistrut Bulletin on Hanging Fluorescent Fixtures, without obligation.

*Name*_____
*Company*_____
*Address*_____
*City*_____ *Zone*____ *Illinois*

NEWS ABOUT PEOPLE

Kelly Named Manager of Public Power District

Ed Kelly has been named general manager of Loup River Public Power District, Columbus, Neb., one of the state's three hydroelectric districts. He has been acting manager since May 1, following the death of Harold Kramer, Loup's first general manager.

Kelly, active in Loup affairs since its organization in 1933, was one of the 11 original directors. He was vice-president of the district from 1941 to 1945 and president from 1945 to 1948 and was appointed secretary in February, 1948. Kelly resigned as a director Jan 1, when he was made purchasing agent for Loup and for the Nebraska Public Power System, composed of Loup and Platte Valley Public Power and Irrigation District, North Platte.

Through Kelly's efforts Loup's rural division, comprising Platte and Colfax Counties, was consolidated with Boone-Nance Rural Public Power District into the present Cornhusker Rural Public Power District. He also was active in developing and financing NPPS's Bellevue, Neb., steam power system and in Loup's refinancing program completed Sept. 16.

•

Dr Irving Langmuir, associate director of the General Electric Co research laboratory at Schenectady, N. Y., has become the second American scientist to receive the Mascart Medal. It is awarded triennially by the French electrical engineering society, the Societe Francaise des Electriciens, to a scholar or engineer in any country "who is distinguished by an ensemble of works on pure or applied electricity." Langmuir has contributed to development of the gas-filled incandescent lamp, high-power vacuum tubes, welding with atomic hydrogen, and a screening smoke generator.

F. M. Winterhalter has been named engineer-in-charge of a-c design and **C. F. Cobb** engineer-in-charge of d-c design by Allis-Chalmers following the retirement of **G. L. Ringland,** chief engineer of the electrical department at the Norwood Works after 43 years of service. Other new Norwood appointments include **E. K. Spooner,** insulation engineer; **I. C. Smith,** mechanical engineer; and **W. T. Saveland,** assistant mechanical engineer.

•

William K. Beard to Quit McGraw-Hill for ABP

William K. Beard, Jr., vice-president and manager of promotion for McGraw-Hill Publishing Co, is resigning to become executive vice-president of the Associated Business Publications, business-paper trade association. He succeeds Stanley A. Knisely, who has resigned effective Dec 1.

WILLIAM K. BEARD

Beard was publisher of ELECTRICAL WORLD and *Electrical Contracting* from 1941 to 1945. He has been with McGraw-Hill, to which he came from the textile industry, since 1924.

His first McGraw-Hill job was as New York area advertising representative for *Electrical Merchandising.* Later he represented that magazine and *Electrical Retailing* in Chicago, sold space for ELECTRICAL WORLD and the company's other electrical papers in the Syracuse area, and represented *Electrical Merchandising, Radio Retailing,* and *Electronics* in the Cleveland territory. In 1935 he went to New York as manager of ELECTRICAL WORLD.

•

Brig Gen David Sarnoff, chairman of the Board of the Radio Corporation of America, has received the Peter Cooper Medal for the Advancement of Science.

Roller-Smith, Elpeco Appoint Sales Officials

Two sales executives have been appointed by Electric Power Equipment Corp, recently purchased affiliate of Roller-Smith.

Donald O. Eschbach has been named assistant sales manager for the switchgear equipment lines of both companies. C. Reynolds Huttinger, made sales engineer for Elpeco, will serve only the affiliate.

Eschbach's experience has been primarily in the generating, transmission, and distribution phases of the power industry. He came to Roller-Smith and Elpeco from Gilbert Associates, Inc, where he had been consulting electrical engineer since 1944. He was employed by General Electric Co from 1925 to 1929 and from 1937 to 1944 and by Philadelphia & Reading Coal & Iron Co from 1929 to 1937. He is a member of the National Society of Professional Engineers and the American Institute of Electrical Engineers.

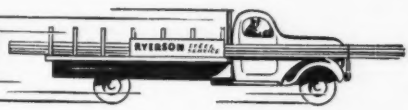
Huttinger since 1946 had been working for Hugh H. Eby Inc and Electric Service Manufacturing Co in an engineering capacity. He was with Elpeco from 1929 to 1942 in several capacities, including design and production management. From 1942 to 1946 he served with the U. S. Navy.

•

Harvey J. Klumb, Rochester Gas & Electric, has been given the annual award plaque of the Radio Fall Meeting sponsored jointly by the engineering department of the Radio Manufacturers Association and the Institute of Radio Engineers. He received the award in recognition of "twenty years of hard work for the Annual Fall Meeting."

L. F. Williams, assistant electrical engineer for Southern Pacific Co, has been appointed electrical engineer. He succeeds **Paul Lebenbaum,** who retired Oct 31, and will be succeeded by **G. W. Kahler,** formerly electrical inspector for the railroad at San Francisco. Lebenbaum started with Southern Pacific in 1903 as assistant electrical engineer at San Francisco and became electrical engineer for the company's Pacific lines in 1932. Williams started in 1923 as

For STEEL in a hurry



Call RYERSON

Wherever you are along the nation's electric utility network, there's a well stocked Ryerson steel-service plant within quick delivery distance. There, carbon, alloy and stainless steels for every requirement are ready for immediate shipment. And a staff of experienced steel men are ready to give your order or inquiry prompt, personal attention.

By carefully specifying and checking, we are able to certify to the consistently uniform high quality of our steels. To help you select the type best suited to the job at hand, the services of Ryerson specialists are always yours for the asking.

Of course the steel strike has depleted our stocks somewhat from normal levels. But we can still take care of a good share of most requirements. So call us when you need steel—no matter what the kind or size.

PRINCIPAL PRODUCTS

BARS—Carbon & alloy, hot rolled & cold finished

SHAFTING—Cold finished, ground and polished, etc.

STRUCTURALS—Channels, angles, beams, etc.

TUBING—Seamless & welded mechanical & boiler tubes

STAINLESS—Allegheny plates, sheets, bars, tubing, etc.

PLATES—Sheared & U. M., Inland 4-Way Floor Plate

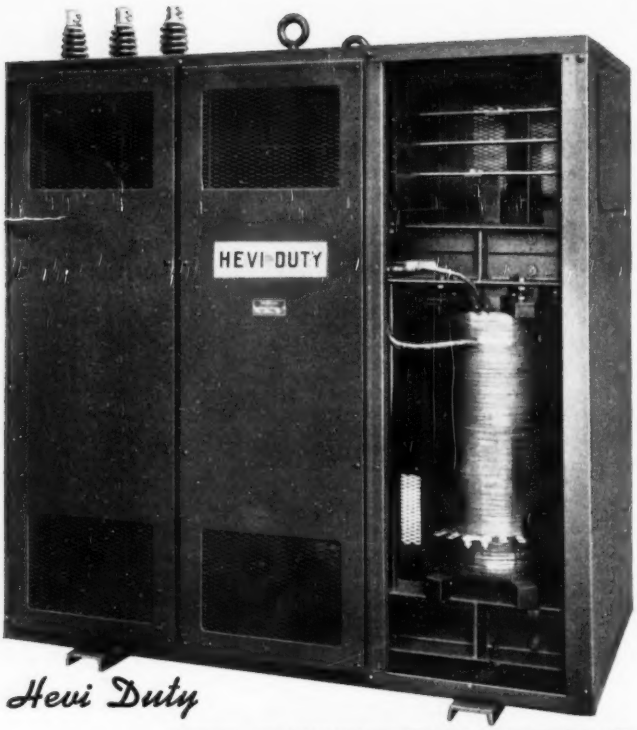
SHEETS—Hot & cold rolled, many types & coatings

MACHINERY & TOOLS—For metal working

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON
PHILADELPHIA • DETROIT • CINCINNATI • CLEVELAND • PITTSBURGH • BUFFALO
CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

RYERSON CERTIFIED STEELS

RYERSON STEEL



Hevi Duty

TYPE 31FH 500 KVA TRANSFORMERS

...for Power Distribution...give you *EXTRA* quality in every feature

WITH the increasing demand for transformers that can be installed at load centers, more and more engineers are looking to Hevi Duty to supply them with the finest and most efficient types.

Type 31FH shown above is illustrated with one panel removed to show the ease of access to the Bus Bar Secondary and Primary taps on the coil. You will note the end plate can be easily removed for installing secondary bus, or for attaching throat to secondary switch gear. This is a 500 KVA, 60 cycle transformer with 2400 volt primary and 240 volt secondary. Transformer is enclosed in a steel cabinet with ample air vents to insure proper cooling.

We have paid special attention to such details as providing proper electrical clearances, adequate coil blocking, clean coil and core ventilating ducts, and high insulation level. All coils are thoroughly impregnated with high corrosion and moisture-resistant varnish by means of vacuum pressure impregnation to give you extra quality and more years of service.

Write for complete details.

HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY

DRY TYPE TRANSFORMERS — CONSTANT CURRENT REGULATORS

MILWAUKEE 1, WISCONSIN

assistant engineer at San Francisco and was promoted to assistant electrical engineer in 1941.

•

Westinghouse Announces New Staff Assignments

Westinghouse Electric has announced the following new appointments:

Harry J. Deines has been named manager of advertising and sales promotion. Account executive and vice-president of Fuller & Smith & Ross, Inc, advertising agency, since 1944, he has been closely associated with advertising programs for Westinghouse products. Formerly he worked for General Electric Co, in engineering test and advertising and sales promotion work.

Walter J. Maytham, Jr, manager of Westinghouse's industrial division, has been appointed Pacific Coast district manager of the company. He joined Westinghouse in 1926 and served as industrial salesman and manager of the petroleum and mining section of the industrial division.

Maytham will take over the duties of **Charles A. Dostal,** vice-president, who retires next May after 43 years of service with the company. Dostal will handle special executive assignments in the Pacific Coast District until his retirement.

T. J. Mathews, assistant manager of the foreign engineering department at East Pittsburgh since 1944, has been made manager. He succeeds **E. P. Schroeder,** who retired after 26 years of service with the company.

Stanley J. Stephenson, former sales promotion manager of the Westinghouse Supply Co in Omaha, Neb., has been appointed merchandising manager of electric ranges manufactured by the electric appliance division.

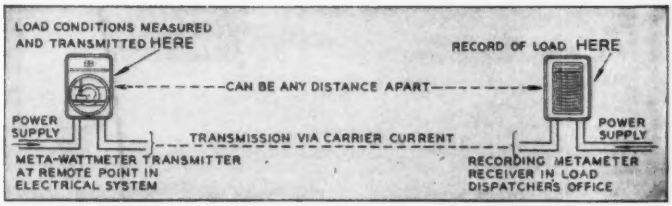
•

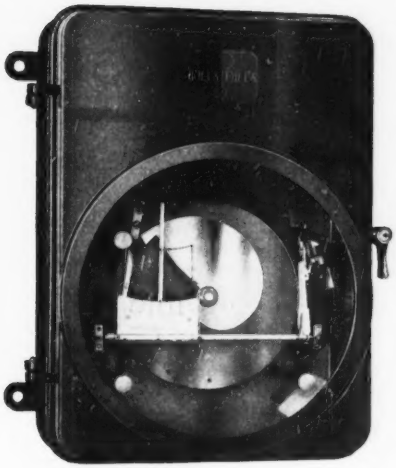
Charles M. Tillett, for the past three years supervisor of the stock transfer department of Ohio Edison Co, has been elected assistant secretary and assistant treasurer. He began his utility career in 1926 in the customers accounting department of Northern Ohio Power & Light Co, an Edison predecessor.

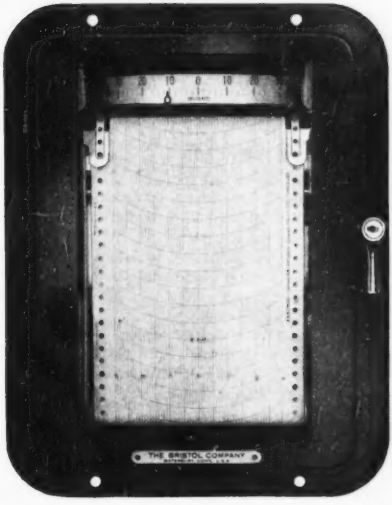
Fentress A. Tucker, commercial manager of the Richmond, Ind., Municipal Lighting & Power Department since 1938, has resigned to become sales promotion manager for Refrigerating Equipment Co, Indianapolis.

Cameron G. Will, principal assistant city engineer of Seattle, retired Oct 15 after 38 years with the City. He joined the department in 1911, two years

HOW TO PREDICT AND PREVENT TROUBLE FROM A DISTANCE


LOAD CONDITIONS MEASURED AND TRANSMITTED HERE
RECORD OF LOAD HERE
CAN BE ANY DISTANCE APART
POWER SUPPLY
TRANSMISSION VIA CARRIER CURRENT
POWER SUPPLY
META-WATTMETER TRANSMITTER AT REMOTE POINT IN ELECTRICAL SYSTEM
RECORDING METAMETER RECEIVER IN LOAD DISPATCHERS OFFICE





Accurate readings of Voltage, Current, Power, Reactive Volt Amperes, and Totalized Load miles away come to you promptly and continuously when your system is watched and reported on by Bristol's Metameter System of Telemetering.

Observations picked up at remote points are recorded by Metameter Receivers at the central station or dispatcher's office . . . give you a complete and visual picture of what is taking place in your system . . . enable you to anticipate abnormalities and prevent emergencies from developing.

The impulse-duration principle on which the Bristol Metameter System of Telemetering works gives you a choice of transmitting media: carrier channel . . . simple two-wire circuit . . . radio beam . . . or any convenient circuit you may select. For full description, write for Bull. M1702. THE BRISTOL COMPANY, 116 Bristol Road, Waterbury 91, Conn. (The Bristol Co. of Canada, Ltd., Toronto, Ont. Bristol's Instrument Co., Ltd., Lynch Lane, Weymouth, Dorset, England.)

Among uses of the Metameter are:

FOR LOAD DISPATCHER OF CENTRAL STATION SYSTEM

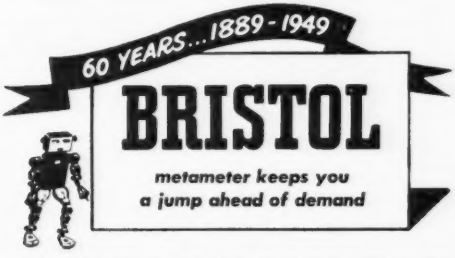
1. Load (active and reactive power and power demand) in each tie-line interconnecting system with neighboring system.
2. Output, or total generated power, of each generating station.
3. Total output of all generating stations, on a single instrument.
4. Active and reactive power and power demand at key points on important transmission circuits.
5. Water level and waterwheel gate position in hydro-electric plant.

FOR OPERATOR OF GENERATING STATION

1. Total output generated in system.
2. Output of each associated attended or unattended generating station in system.
3. Desired output of operator's own station.

FOR DISPATCHER OF DISTRIBUTION SYSTEM

1. Total kilowatt load on unattended substations.
2. Bus voltage of unattended station.
3. Feeder amperes.



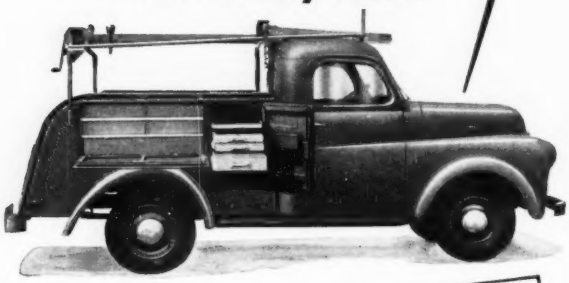
AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

it's NEW!

YORK-HOOVER

model 4978

Public Utility BODY



* **Practical** . . . because all material and tools for light duty work are conveniently located.

* **Flexible** . . . because standard and optional equipment are available to accomplish your specific job quickly and economically.

* **Efficient** . . . because all material and tool arrangements are in logical sequence and available for daily inventory.

Get the facts on the Model 4978 Body designed for installation on a standard ½ ton chassis. Write for Bulletin No. 927 today!

YORK, BODY DIVISION YORK-HOOVER CORPORATION PENNA

after graduation from the University of Washington, and has been with it ever since except for three years when he was on loan to City Light superintending construction of the first unit of Ross Dam. He also has served as acting city engineer.

Ralph P. Faulkner, supervisor of motor vehicles for Pennsylvania Power & Light Co, has retired after 23 years of service. He has served as chairman of the Pennsylvania Electric Association's transportation committee.

Ernest P. Schroeder, Westinghouse Electric International Co's resident representative at the East Pittsburgh Works since 1936, has resigned. He will be succeeded by **Angus G. Scott,** formerly assistant resident representative at East Pittsburgh. Schroeder had been with Westinghouse since 1917, first with the Export Co and later with the International Co.

Harvey A. Keys, promotional sales manager of Northern States Power Co, retired Oct 15 after 41 years in utility sales. He had served as lighting salesman and supervisor of appliance sales for Commonwealth Edison Co; vice-president and general manager of Equitable Sales Co, an affiliate of Duquesne Light Co and Equitable Gas Co; and as manager of merchandise sales and sales manager of Byllesby Engineering & Management Corp.

OBITUARY

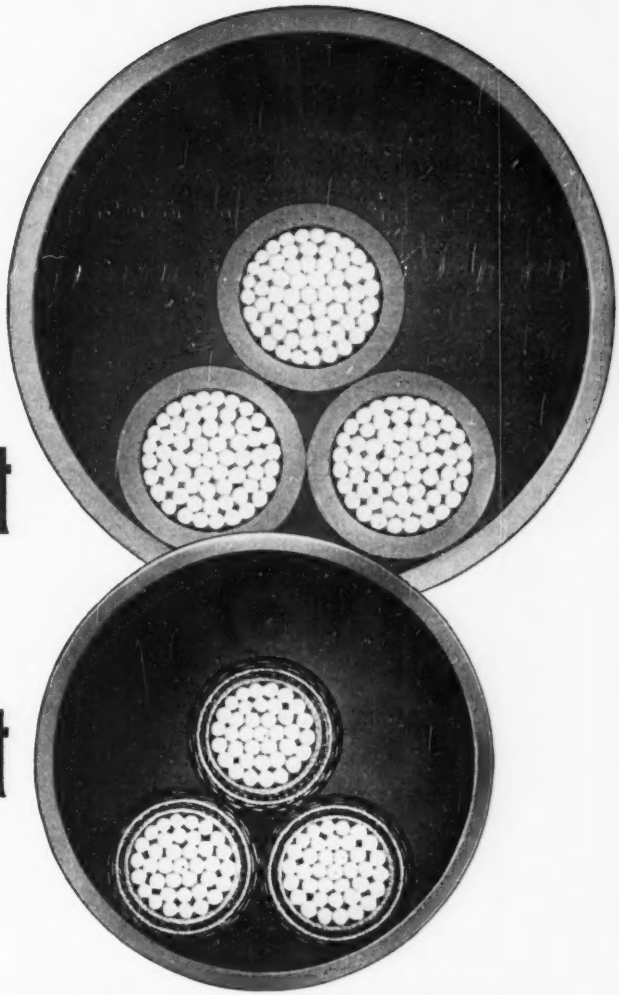
Matthew A. Morrison

Matthew A. Morrison, Kenilworth, Ill., pioneer investment banker and public utility executive, died Nov 3 at the age of 70. He was manager of the secretarial and treasury department of Pioneer Service and Engineering Co, Chicago.

Since 1909 Morrison had been affiliated with financial and public utility interests of H. M. Byllesby & Co, Standard Gas & Electric Co, and subsidiary and successor companies. He had served as vice-president, secretary, and treasurer of Standard G&E, vice-president and secretary of H. M. Byllesby, and as vice-president and secretary of Byllesby Engineering & Management Corp, later known as Public Utility Engineering & Service Corp.

During his career he served as an officer or director of various public utilities, including Northern States Power Co, Minneapolis; Wisconsin Public Service Corp, Milwaukee; Duquesne Light Co, Pittsburgh; Louisville (Ky) Gas & Electric Co; Southern Colorado Power Co. Pueblo; Oklahoma Gas & Electric Co, Oklahoma City; San Diego (Calif.) Consolidated Gas & Electric

Why Buy 4" Conduit when 3" Conduit will do?



INSTALLED COSTS ARE LOWER

with high-rated ROCKBESTOS A.V.C.® and a 430 Ampere Load*

Size for size A. V. C. has a HIGHER AMPERE RATING

Hi

...YOUR BEST BUY

- you buy 25% *smaller* conduit
- you use 38% *smaller* cable
- you use *smaller* fittings and lugs
- you have lower labor costs because smaller, lighter cable and conduit are quicker and easier to handle.

To save money specify *permanently-insulated* Rockbestos A.V.C. Write for the booklet "The Story of An Insulation."

*Comparison made with Type RH based on Chapter X, National Electrical Code, 40°C-104°F Ambient

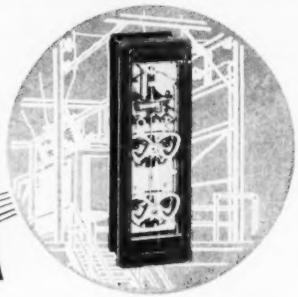
ROCKBESTOS A.V.C.

ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONN.

NEW YORK CLEVELAND DETROIT CHICAGO PITTSBURGH ST. LOUIS LOS ANGELES OAKLAND, CAL.

Telemetering Systems

For Speedy, Accurate, Remote Measurement



Measure Current, Voltage, Power, Pressure, Position, Flow, and other quantities

Use Any Indicating Or Recording End Device

General Electric telemetering systems can help increase the speed and accuracy of many of your control functions. They are an economical means of providing needed information from one or many sources at a central control point.

SPECIAL ADVANTAGES are offered with the G-E frequency-type system. It has rapid response, continuous output, and maximum channel utilization, and is usable over long distances. It requires virtually no maintenance because it has neither contacts nor electrochemical relays. In addition, it's accurate and stable despite fluctuations in supply voltage.

FULL DETAILS on the three G-E systems (frequency-type, torque balance, and photoelectric) plus various combinations of them, are available in a new bulletin, GEA-5223. It has diagrams and pictures of many different telemetering arrangements. Get a copy from your nearest G-E office. Or write today to *Apparatus Department, General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

Co; California Oregon Power Co, Medford, Ore.; and Mountain States Power Co, Albany, Ore.

•

Charles E. Brown, Jr

Charles E. Brown, Jr, vice-president of The Okonite Co, Passaic, N. J., died Nov 8 in New York City after a long illness. He was 55.

Brown, who started his business career with Central Electric Co of Chicago, electrical wholesale house, joined Okonite in 1925 as Chicago manager of its power and light department. Five years later he came to New York as assistant to the company's president.

CHARLES E. BROWN, JR

Later he went to Washington, D. C., to establish a sales office, and in 1941 he was appointed a vice-president, serving in that capacity as the company's Washington representative. After the war he returned to New York and in 1946 became vice-president and general sales manager.

•

Glenn A. Jernigan, 63, superintendent of transmission and distribution for El Paso (Tex.) Electric Co, died Oct 31. Before joining El Paso Electric in 1935 he had been associated with Gulf States Utilities, Lake Charles, La. Earlier he had been a member of Stone & Webster Co in Port Arthur, Tex.

Rudolf Dueland, an engineer with International Ebasco Services, New York, died Nov 8 in Havana following a heart attack. He had gone to Havana two months before on assignment with Cuban Electric Co.

Ben M. Tassie, Pacific district manager of General Electric Co's Appliance and Merchandise Department, died in San Francisco Oct 31. He was 60 years old. Tassie had joined GE in 1941. Earlier he had been with Manning Bowman Co. as Pacific Coast representative and later president.

A Permaflector Lighting Portrait

GIMBELS · PITTSBURGH

William York Cocken, Architect
The Trimble Co., General Contractors
C. W. Carter Elec. Construction Co.
Electrical Contractor

Here, in Gimbels newly designed first floor, fluorescent and incandescent silvered-glass Permaflectors produce "light for selling." Dramatic yet functional illumination is achieved with the 203 combination, ceiling recessed, fluorescent-incandescent units.

To transfer your creative lighting designs from "blueprint" to reality is relatively simple when you specify Pittsburgh Permaflector Lighting Equipment. Pittsburgh Reflector Company has the equipment and know-how required to give you efficient, economical illumination that exactly fills your needs—whether your plans call for fluorescent or incandescent light or a combination of both. You will find it worthwhile to discuss your problems with Pittsburgh Permaflector Engineers. Why not call or write today?

PITTSBURGH REFLECTOR COMPANY

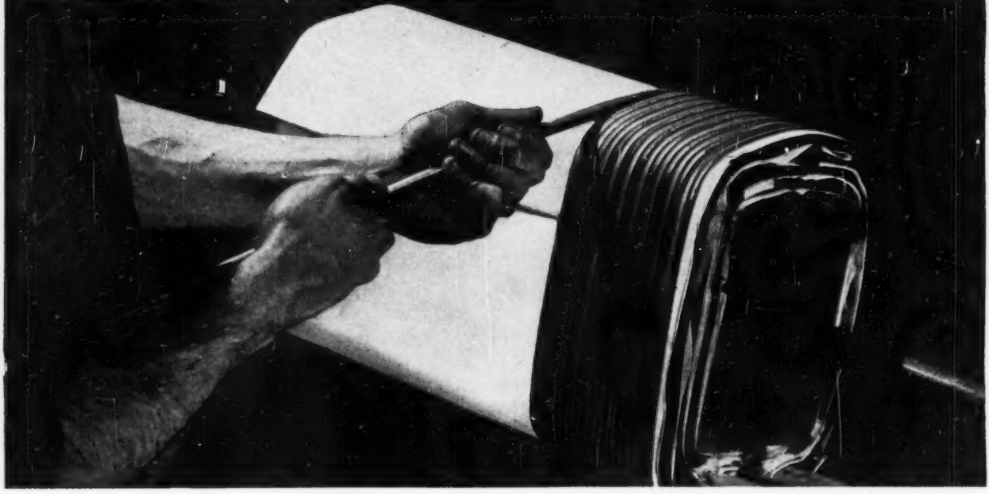
408 OLIVER BUILDING • PITTSBURGH 22, PENNSYLVANIA

MANUFACTURERS OF FLUORESCENT & INCANDESCENT LIGHTING EQUIPMENT

Permaflector Lighting Engineers in All Principal Cities

PITTSBURGH PERMAFLECTOR LIGHTING EQUIPMENT IS DISTRIBUTED BY BETTER ELECTRICAL WHOLESALERS EVERYWHERE

Johns-Manville Announces Two New



Smooth layers of Quinterra Type 6 Electrical Insulation (Twin-ply), used in winding a Marcus dry-type transformer

Quinterra

TYPE 6 (TWIN-PLY)

A new cost-reducing, high-temperature insulation that prolongs transformer life many times through its resistance to pyrolysis

Here is a radically new asbestos-base, continuous-sheet, paper-like electrical insulation that offers many economies. It is primarily intended for interlayer and wrapper insulation in windings and coils used in Class A and B transformers (internal hot-spot temperatures 130C, or higher if special varnishes are employed).

Quinterra Type 6 is plied at the factory by welding two layers of Quinterra and calendering them into a dense, strong and smooth-surfaced insulation having good tensile and bursting strengths. For economical application with a minimum of waste, Quinterra Type 6 is furnished in continuous rolls cut to exact widths.

Excellent handling properties

Uniformity of physical and handling properties enables assemblers to achieve production rates such as are attained with the best types of interlayer and wrapper insulations. Further economies result from the large square-foot-per-dollar coverage.

Excellent constructional advantages

The plied construction of Quinterra Type 6 offers two distinct constructional advantages: (1) It provides better dielectric protection than a single layer. (2) Under stress, the weaving strains within coil structures are less likely to damage a plied insulation than a single-layer insulation.

Excellent dielectric-thermal characteristics

The base sheets of all Quinterra products are made 100% inorganic, but, for mechanical reasons only, are saturated with an organic resin. At room temperature (ASTM conditions) Quinterra Type 6 averages in excess of 350 VPM. After prolonged exposure at 175C, long after the thermoplastic saturant is driven off, it still maintains its original dielectric strength and requires only the re-establishment of its varnish protection to provide a further useful life cycle.

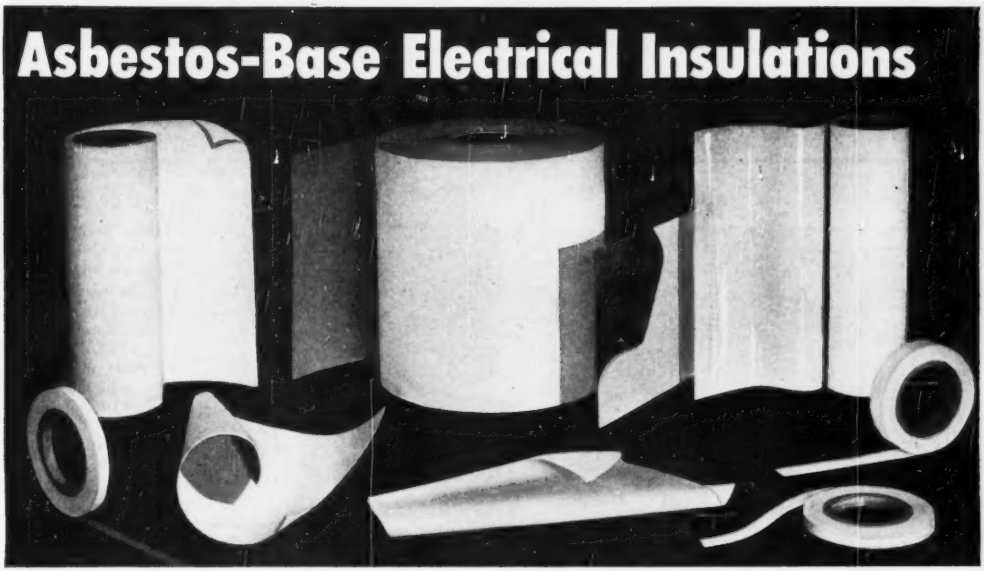
We will be glad to provide you with samples and further information about Quinterra Type 6 Electrical Insulation. Write Johns-Manville, Box 290, New York 16, N. Y.

Weights and thicknesses of Quinterra Type 6

Thickness ± 10%	Weight Per 100 sq ft ± 15%	Approx Coverage sq ft lb
.0045"	2.5	40
.006"	3.3	33
.007"	3.8	26
.008"	4.5	22
.009"	4.8	20
.010"	5.5	18
.012"	6.2	16
.015"	7.2	14

Johns-Manville

Asbestos-Base Electrical Insulations



A variety of types of electrical insulations as produced by combining glass, mica, and organic papers and films with Quinorgo #3000 or #4000.

Quinorgo

#3000 AND #4000

New, economical, high-temperature insulations with a previously unattainable combination of dielectric and mechanical properties

Quinorgo #3000 and Quinorgo #4000 are two new insulations developed by Johns-Manville. Each can be used alone or in combination with other dielectrics. In the latter use they can be either treated or coated with insulating varnishes, or combined with organic or inorganic electrical insulating sheets or films.

Quinorgo insulations contain 80% or more of specially processed asbestos fiber, the remainder being selected organic fibers and binders. The two types differ in that the organic portion of Quinorgo #4000 contains a small amount (3% or less) of resin not present in Quinorgo #3000. The resin slightly reduces absorption and penetration.

These highly improved forms of asbestos electrical insulations have extreme uniformity of texture and caliper (from .005" to .015"). They are furnished in continuous rolls, in tapes of exact widths and in sheets cut to size.

Excellent for compactness — Quinorgo #3000 and #4000 have important advantages where asbestos papers previously could not be used because they were too thick, their dielectric too low, or strength inadequate.

Excellent for "composites" — Quinorgo #4000, because of its heat resistance, closed nonwoven structure, uniform thickness and special penetration characteristics, is ideal for use in composite insulations.

For example, it may be coated on one surface with shellac or varnish to permit bonding or cementing to it such mechanically or dielectrically stronger materials as inorganic woven cloths and mica or organic cellulose films or sheets. The opposite surface remains ready for absorption of treating varnishes used in the further processing of equipment after the composite insulation has been applied.

Excellent for economies—Quinorgo #3000 and #4000 may be economically substituted for quality grade organic or inorganic layer insulation. When varnish-protected in apparatus, they will perform indefinitely because of their high asbestos content. (Hot-spot temperatures to 130C).

We will be glad to provide you with samples and further information about Quinorgo insulations. Write Johns-Manville, Box 290, New York 16, N. Y.

General average properties of Quinorgo #3000 and #4000

Thickness	Lbs Per 100 sq ft	1" wide Longitudo T.S. lbs	Dielec Min VPM
	3000-4000	3000-4000	3000-4000
.005"	1.5 1.7	14 15	300
.007"	2.2 2.5	18 19	300
.010"	3.3 4.0	20 21	250
.015"	4.7 5.7	26 28	200

Electrical Insulations

JOHNS-MANVILLE JM PRODUCTS

MANUFACTURERS and MARKETS

FIRST WATTHOUR METER to be made by Roller-Smith in more than 30 years is turned over by E. S. Maury, left, manager of instrument sales, to Walter S. Gubelmann, Jr., president. At right are F. T. Ritter, production manager, and K. C. Schmickley, manufacturing manager

Roller-Smith Returns to Manufacture of Watthour Meters after 30 Years

Roller-Smith has returned to the manufacture of watthour meters after an absence of more than 30 years. Officials announced last week that the company is now in production on a single-phase, socket-type watthour meter for house service at its Bethlehem, Pa., plant.

The new meter is being made in 2 or 3-wire, single-phase, 5 or 15-amp ratings for 120 or 240-v service with a choice of standard clock-type or cyclometer registers. Production of these meters is expected to be increased from a few hundred to more than a thousand a day by the first of the year, when deliveries from stock and in quantity probably will be effected.

Under development since 1946, the new meter, to be known as Type S-3, has been approved under the code of electricity meters following completion of tests at the Electrical Testing Laboratories, New York.

Plans are under way for the design and production of polyphase watthour meters for switchboards, which will be introduced within a year to 18 months.

Roller-Smith first entered the watthour meter field in 1909 when the company, then under the management of its founder, Colonel Roller, acquired the Columbia Meter Co of Indianapolis. From that time until World War I Roller-Smith made both single-phase and polyphase a-c as well as d-c watthour meters. Even in those days the company offered a choice of clock-type or cyclometer registers.

The company's return to the watthour meter field after more than 30 years' absence is part of the present management's plan to expand its existing line of instruments, relays, circuit breakers, and switchgear with items that will complement each other and provide as complete a line of products for utility use as is possible within the scope of the company's operations.

•

GE Offers Fluorescents That Don't Distort Color

New fluorescent lamps that bring out the "full beauty" of all colors and are complimentary to human complexions have been developed by General Electric Co's Lamp Department after 10 years of research.

Described as "the most important fluorescent lamp improvement since the introduction of fluorescent lighting in 1938," the new lamps overcome the chief objection to the use of fluorescent light in homes. They are expected to open "virtually a virgin field" for this type of lighting, Henry J. Chanon, GE fluorescent lamp sales specialist, reports.

The lamps were made possible by development of a special fluorescent powder, designated the "DR" phosphor. Named "de luxe cool white" and "de luxe warm white," they have an inner coating of the phosphor, composed of a "doubleactivated calcium phosphate."

GE's new general lighting fluorescent lamp line consists of four lamps, two of which provide a cool atmosphere and two a warm one. Each group contains a high-efficiency or "standard" lamp and a lamp of best color rendition, or "de luxe." The present 4500 white lamp becomes known as "standard cool white" in the new line and the warm tint lamp becomes the "standard warm white."

The new de luxe fluorescent lamps will be available in the 40-w size in limited quantities early next year. Other sizes will follow. Standard lamps are currently available.

MANUFACTURING BRIEFS

In an effort to promote export trade the British Electrical & Allied Manufacturers' Association has published an 868-page catalog. Described as "the most comprehensive and authoritative catalog . . . ever made available to overseas buyers on the products of a single industry," it includes descriptions of the industry's main products in the fields of power plant, industrial, transport, and communications equipment as well as domestic and commercial appliances, lighting accessories, and installation material; a classified buyer's guide; and a directory of BEAMA members. Ten thousand of the 13,000 copies printed have been sent overseas.

An inexpensive method of modernizing existing table and floor lamps to produce more and softer light has been introduced by the home lighting department of the Westinghouse Lamp Division, Bloomfield, N. J. The con-

Two Problems SPACE and FLEXIBILITY Solved by Cochrane Design

86 YEARS OF SERVICE

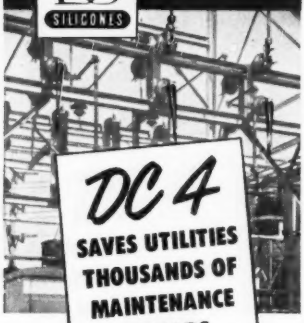
TYPICAL of the ability of Cochrane engineering to overcome space limitations, is this installation serving a large New England public utility. The Cochrane Deaerator is a 900,000 lb./hr. unit providing oxygen-free feed water for 100% boiler make-up. Space for the installation was extremely limited considering the large capacity required. However, the problem was solved with a Cochrane Deaerator of ribbed cast iron with caulked joints, virtually custom tailored to fit the job. Another interesting fact about this particular installation is the use of the double heater tops on a single rolled plate storage tank, so piped that one can be isolated while the other continues in operation. Years of experience with unusual installation problems has given Cochrane the "know how" to fit thoroughly efficient, correct-capacity deaerating equipment into very limited space. Cochrane Deaerators are made in a wide variety of standard sizes and types, as well as special designs for plants with unusual space requirements. Cochrane Publication 3005 illustrates many interesting applications of Cochrane Deaerators, and gives complete details on their operation. Your copy may be had by writing to Cochrane Corporation, 3146 N. 17th Street, Philadelphia 32, Pa. In Canada, Canadian General Electric Company, Ltd., Toronto.

COCHRANE

DEAERATORS • HOT PROCESS SOFTENERS • FILTERS
ZEOLITE SOFTENERS • CONTINUOUS BLOWOFF SYSTEMS

Silicone News

DC SILICONES



DC 4
SAVES UTILITIES THOUSANDS OF MAINTENANCE DOLLARS

This tip from a large utility company can greatly reduce your maintenance costs on pole top disconnect switches. A thin coating of DC 4 Silicone Compound assures positive and easy operation of disconnect switches by preventing oxidation and by reducing adherence of ice. DC 4 is also used to prevent oxidation of the metal and to lubricate switch clips, hinges, jumper cables and switch bearings exposed to all kinds of weather.

Between the power-house and the consumer, there are dozens of places where this Dow Corning Silicone Compound is used as an auxiliary dielectric, as a waterproof seal and as an oxidation resistant lubricant that does not harden or melt at temperatures from -67° to +400°F. For example, a coating of this inert silicone compound lubricates and protects rubber and plastic covered cable from weathering, corona cutting and corrosive atmospheres. Voids in splicing of ACSR Cables are filled with DC 4 to prevent oxidation and to improve the conductivity of the splice. DC 4 prevents corrosion of the contacts and screws in type S watt-hour meters and serves as a permanent non-thinning lubricant in water meter gear trains.

DC 4 meets all of the requirements of Army-Navy Specification AN-C-128a. It is stable at temperatures from -67° to +400°F. It is highly water-repellent, nontoxic and inert to metals and insulating materials. It is highly resistant to oxidation, corrosive atmospheres and to the deterioration caused by corona discharge. It has excellent dielectric properties.

For more information phone our nearest branch office or write for data sheet P-11

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

Atlanta • Chicago • Cleveland • Dallas
Los Angeles • New York
In Canada: Fiberglas Canada, Ltd., Toronto
In England: Albright and Wilson, Ltd., London

FIRST in Silicones
Dow Corning

Indications that 5.6 million television sets will be in use by the end of next year are contained in new market research studies conducted by General Electric Co. This figure is expected to jump to 19.3 million five years from now.

Simpler, less expensive circuits will give high-quality television reception, W. B. Whalley of the physics laboratories of Sylvania Electric Products, Inc, told members of the engineering department of the Radio Manufacturers Association and the Institute of Radio Engineers recently. Fewer components should mean fewer failures and less need for servicing, he said. One method of simplification he suggested was development of multi-purpose tubes performing three functions simultaneously to replace the three tubes that are now used.

Larkin Lectro Products Corp has moved its entire plant and office facilities to larger quarters in Pine Bluff, Ark. Production of liquid-immersed and dry type power and distribution transformers will be expanded to include sizes up to 10,000 kva and 69-kv class. Deliveries from the new location are scheduled to begin Dec 1.

Up to 20 annual scholarships of $500 each will be provided by Allis-Chalmers Manufacturing Co for children of its employees. A minimum of five scholarships will be awarded to applicants desiring to enter school between June 1, 1950, and May 31, 1951. The one-year grants may be renewed if scholarship standards are met. Each applicant must have at least one parent with a minimum of three years of service in the firm.

Reynolds Metals Co has launched an $8-million expansion program in its Alabama operations which will increase its number of employees in the area by several thousand. Among the additions at the Reynolds Alloys Co plant at Listerhill, Ala., will be a cable plant slated to turn out ACSR at the rate of 1,000 miles a day.

A 1,250-hp, direct current motor—one of the largest ever designed for a paper-forming machine—will be built by Westinghouse Electric Corp for delivery to the Enso-Gutzeit paper mill in Finland. The order is valued at $143,000.

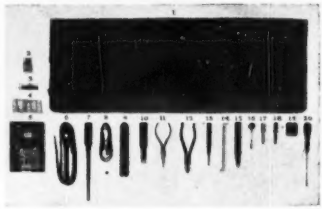
STATES TESTING EQUIPMENT

HERE IT IS:—
Have YOU a copy?

Binding Posts
Plugs
Receptacles
—
Insulated Wrenches

FUSED DEVICES
Popular and necessary devices for protecting tester and equipment. A full line from 1 amp. to 30 amp.

TOOL KIT



A well selected kit of tools

Insulated Screw Driver

Yes—Send to

THE STATES Company, Hartford 6, Conn.
Please send me the new ACCESSORY catalog.

Name ..... Title .....

Firm .....

City ..... State .....

What does USKON® Electric Heating *mean to* Electric Light and Power Companies?

Uskon is first of all the nearest thing to perfect heat yet devised . . . from the standpoint of human health . . . for its extremely efficient utilization of power services.

THE MOST HEALTHY HEAT EVER PERFECTED

Uskon provides uniform heat from head to foot, primarily warming *objects*, not the air. Floors and walls are always warm, humidity remains constant. The air is more fresh, and colds are fewer. Uskon represents what is unqualifiedly the greatest sanitary and hygienic advance in the history of home heating. To be a prime factor in bringing it to more and more people is a fact of great public relations value to the utilities.

PROVIDES MOST EFFECTIVE USE OF SERVICE LINES

But Uskon approaches the theoretically perfect heat for other reasons too. It heats people and objects. Uskon does not have to count on a large excess capacity to overcome lag and give fast pickup as do convection heat systems. With Uskon, detailed engineering specifications are completed for each home. This careful design means that the utility is assured the most efficient use of its equipment and services.

AVOIDS SEVERE STRAIN ON SECONDARIES

Most electrical heaters marketed today are of the convection type. They labor to heat the *air*, building up sudden heat loads and putting severe strain on the utility system. Uskon always supplies radiant heat—directly balancing the body heat loss. With group installations, Uskon shifts the wintertime peak from the evening to the morning, just when the distribution transformers are in the best position to handle it. And because of Uskon's individual room control, peaks in the load are reduced to the absolute minimum through diversification.

THE PATTERN FOR THE FUTURE

Uskon electric radiant heat, because of its healthfulness, cleanliness, convenience and ease of operation, is destined to play an even larger part in home heating. Uskon is a product of United States Rubber Company and is distributed exclusively by Graybar Electric Company.

Electric heat of the radiant type, like Uskon, reduces peak loads and provides favorable load factors.

We welcome inquiries seeking more complete information about Uskon. One of our sales engineers will supply any facts required. Write Electrical Wire and Cable Department, United States Rubber Company, 1230 Avenue of the Americas, New York 20, N. Y.

Uskon is an electrical radiant heating system utilizing rigid panels placed in the ceiling

USKON USES ELECTRICAL ENERGY ECONOMICALLY BECAUSE:

1. **Effective utilization of radiant waves primarily heats people and objects—not air.**
2. **Rigid engineering specifications of installation and insulation are observed.**
3. **Uskon allows individual room control.**

UNITED STATES RUBBER COMPANY

SERVING THROUGH SCIENCE

Electrical Wire and Cable Department, Rockefeller Center, New York 20, N. Y.

Sentinels of Service

KOPPERS

Long-Life Poles and Crossarms

UNINTERRUPTED SERVICE! . . . that's what you are constantly striving to give your customers. And you are off to a good start when you specify Koppers—the poles that are pressure-creosoted against decay . . . that *retain* their strength, and last, on the average, *more than thirty years.*

For maximum utility, combine Koppers Pressure-Treated Crossarms with Koppers Long-Life Poles. Together, they give you the lowest annual costs, and give you best assurance of uninterrupted service.

KOPPERS COMPANY, INC.
Pittsburgh 19, Pa.

Deliveries of Koppers Pressure-Creosoted Poles are made promptly from many conveniently located treating plants.

KOPPERS PRESSURE-CREOSOTED WOOD

NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

California—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Bethany, Calif., outdoor power circuit breakers, disconnecting switches, grounding blades for Tracy Switchyard, Central Valley Proj., Spec. 2824. L. N. McClellan, ch. engr.

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., distribution boards, battery charger, terminal cabinet and transformers for Estes Power Plant, Estes and Marys Lake power plant penstock gate structures and Olympus Dam, Colorado-Big Thompson Proj., Spec. R 7-88 (Region 7). L. N. McClellan, ch. engr.

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, distribution and control cabinets for Estes and Marys Lake Power Plant, Estes Park, Spec. R7-91 (Region 7), Colorado-Big Thompson Proj., L. N. McClellan, ch. engr.

Ia., Ames—State Bd. Educ., Des Moines, turbo-generator, generating unit and condensing equip. Brown Eng. Co., 322 K P Bldg., Des Moines, engrs.

Kansas—Twin Valley Electric Co-operative, Altamont, 161.71 mi. rural distr. lines, conversion 47 mi. lines in Neosho, Montgomery, Labette and Cherokee Counties. $150,000. Frank Horton & Co., Lamar, engrs.

Minn., Elk River—Rural Co-operative Power Assn., Maple Lake, 174x189 ft., 1,300,000 cu. ft. steel, concrete, brick generating plant superstructure, 80 ft. high. Approx. 800,000. Long & Thorshov, 400 Metropolitan Life Bldg., Minneapolis, archts., R. D. Thomas & Assoc., 400 Metropolitan Life Bldg., Minneapolis, engrs.

Missouri—Co-Mo. Electric Co-operative, Tipton, 405.95 mi. rural distr. lines and 39.5 mi. conversion lines, in Benton, Camden, Cole, Cooper, Moniteau and Morgan Counties. $450,000. Frank Horton & Co., Lamar, engrs.

Montana—U. S. Eng., Fort Peck, power, light and communication cables, water level recording sys., gate position indicator and air compressor, Fort Peck dam and power site. CIVENG-25-016-50-16.

Montana—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., Havre-Shelby 115-kilovolt transmission line, between Havre substation and Shelby substation site Fort Peck Proj., Spec. 2825. L. N. McClellan, ch. engr.

Nebraska—Madison County Rural Public Power Dist., Battle Creek, 250 mi. rural distr. lines, Madison Co. $300,000. H. S. Nixon Eng. Co., WOW Bldg., Omaha, engr.

New York—Delaware County Electric Co-operative, Inc., Delhi, 55 mi. rural distr. lines and sys. imprvs., Delaware Co. $205,000.

N. Y., Johnstown—New York State Gas & Electric Co., 62 Henry St., Binghamton, Gouly Station, power plant, $7,000,000-$8,000,000. Gilbert Assoc., Inc., 412 Washington St., Reading, Pa., engr.

North Carolina—Davidson Electric Membership Corp., Lexington, 45 mi. rural distr. lines and sys. imprvs., Davidson Co. $229,000.

Oklahoma—U. S. Eng., P. O. Box 61, Tulsa 2, powerhouse and switchyard, Fort Gibson Dam Power Development, Grand (Neosho) River, Inv. No. CIVENG-34-066-50-50.

Oregon—Bonneville Power Admin., 729 N. Oregon St., Portland, Zone 8, clearing 39.9 mi. Lebanon-Goshen 230-kv power transmission line route, Lane and Linn Counties, Inv. 4869. Plans deposit $5.

Tennessee—Tennessee Valley Electric Co-operative, Savannah, 145 mi. rural distr. lines and sys. imprvs., Hardin Co. $600,000.

Utah, St. George—Town, c/o Mrs. Ellen

S. Bentley, recdr., St. George, voted bonds, Oct. 27, enlarging power plant. $160,000. W. W. Cannon, c/o owner, city engr.

Washington—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Odair, ampere bus structures with current transformers, potential transformers, disconnecting switches, grounding switches and generator-protective equip. for Grand Coulee Power Plant, Columbia Basin Proj., Spec. 2827. L. N. McClellan, ch. engr.

Low Bidders & Contracts Awarded

Alabama — Clarke-Washington Electric Membership Co-operative Corp., Jackson, 12.95 mi. 44 kv rural distr. lines, Clarke and Washington Counties, to G. T. Key Co., 1212 S. Hull St., Montgomery, **$52,-632**; 364.8 mi. rural distr. lines, Clarke and Washington Counties, to Trans-Electric Co., 106 E. Broadway, Louisville, Ky., **$349,174.** Lanier Eng. Co., 102½ Elm St., Troy, engrs.

Alabama—Joe Wheeler Electric Membership Corp., Hartselle, 285.3 mi. rural distr. lines, Morgan Co., to Western Constr. Co., Inc., Jackson, Tenn., **$395,998.** McWhorter & Franklin Engineers, 2535 Franklin Rd., Nashville, Tenn., engrs.

Arizona—Navopache Electric Co-operative, Inc., Lakeside, 54 mi. 69-kv transmission line, and 174 mi. rural distr. line, Navajo Co., to Walker Constr. Co., 5151 E. Jefferson St., Dallas, Tex., **$189,533** and **$208,548 respectively.** Tynes & Loftin, 512 Heard Bldg., Phoenix, engrs.

Arkansas—Ozarks Rural Electric Co-operative Corp., Fayetteville, 198.37 mi. rural distr. lines, Washington Co., to Southern Line Constr. Co., 818 Falls Bldg., P. O. Box 1338, Memphis, 1, Tenn., **$224,-816.** Frank Horton & Co., Lamar, Mo., engrs.

Kansas—Coffey County Rural Electric Co-operative Assoc., Inc., Burlington, 482.81 mi. rural distr. lines, Coffey Co., to Weikel Constr. Co., 1150 Fairview Ave., Fort Wayne, Ind. **$638,873.** Flora Eng. Co., 1717 E. Colfax, Denver, Colo., engr.

Tenn., Nashville — Nashville Electric Service, Church St., service center and office to Foster & Creighton, American Natl. Bank Bldg., Approx. **$2,250,000.** Bids 11/1.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Ill., Chicago—1350 Corporation, Michigan Shore Apts., 1350 N. Lake Shore Dr., Zone 10, two 21 story, 740 unit apartments, $7,000,000. Loebl, Schlossman & Bennett, 333 N. Michigan Dr., Zone 1, archts.

Ill., Oak Park—Baptist Home & Hospital, 315 Pine St., plans by E. E. & Elmer C. Roberts, 201 W. Wells St., Chicago, Zone 6, hospital and hospital addn. **$2,500,000.**

Pa., West Point—Sharp & Dohme, 640 N. Broad St., Phila., research laboratory, $4,000,000. W. Stuart Thompson & Phelps Barnum, 250 Park Ave., New York, N. Y. archts.

Wash., Seattle—King County Housing Auth., 2 and Pine Bldg., Zone 1, 1,000 housing units in area adjacent to city. **$7,000,000.**

Low Bidders & Contracts Awarded

N. J., Irvington—Maurice & George Levine, c/o Kelly & Gruzen, archts., 80 Fifth Ave., New York 3, N. Y., The Parkway Garden Apartment development for 13444 families on 23 acres site bounded by Eastern Parkway, Grove St., Berkeley Terrace and Maple Ave. Owner builds. **$20,000,000.**

Tex., El Paso—Province Memorial Hospital, Dr. L. L. Evans, dist. supt., El Paso, Nov. 1, 6 story, bsmnt., steel 272 bed Memorial hospital and nurses home, concrete pier and beam fdn., Robert E. McKee, Box 562. **$2,227,300.** Est. $2,000,000.

Tex., Houston—A. O. Smith Corp., M. Esperson Bldg., pipe mill, to The Austin Co., M & M Bldg. Approx. **$4,500,000.**

W. Va., Charlestown—State Office Bldg. Comn., State Capitol Bldg., state office $4,500,000. Extended date. Cass Gilbert, Inc., 342 Madison Ave., New York, N. Y. archt.

Sleeping Peacefully

...thanks to Creosote!

THE fellow in the picture who is knocking off those solid hours of well-earned sleep is a telephone lineman. His company (lucky for him) uses poles that are pressure-*creosoted* against decay . . . that *stay* sound and serviceable. So there's small chance that pole failures will force him out into the night—when repair work is most difficult and dangerous.

Decay is the greatest threat to the strength and serviceability of wood, and creosote has established an enviable record in preventing it. Case histories show that pressure-creosoted poles—in line for over 30 years—are still capable of giving good service for some time to come.

For the best possible creosote delivery service, get in touch with Koppers—the nation's largest distributor. Koppers has 14 creosote-producing plants and 4 large storage plants. Your creosote requirements can be met promptly.

KOPPERS COMPANY, INC.
Pittsburgh 19, Pa.

All Standard Specifications
For All Types of Wood Preservation

KOPPERS **CREOSOTE**...*to be sure*!

The Labor Union Monopoly Bites *ALL* Workers

What kind of government is it which:

. . . Prosecutes the Great Atlantic & Pacific Tea Company which it asserts handles about 6½% of the retail food distributing business as an illegal monopoly in restraint of trade, and

. . . Seeks to break up four big meat packing companies and make them into 14 companies, charging the four with being a monopoly in restraint of trade, but

. . . Makes no move whatsoever to apply the federal anti-trust laws to the exercise of virtually 100 percent monopoly control of labor in the coal industry, and the only slightly less complete monopoly control of labor in the steel industry?

The answer to that question is simple. It is class government of the most flagrant type, a government by which special privileges are dispensed without justice and to the great injury of all workers. It is the kind of government which will lead to the early sacking of the American enterprise system and the personal freedoms of workers.

In legal terms the explanation of this flagrant affront to good government is also simple. In 1932 labor union activities were given virtually complete exemption from the application of the federal anti-trust laws by passage of the Norris-LaGuardia Act.

continued on next page

When the Norris-LaGuardia Act was passed labor unions were relatively weak. Only about 16% of the nation's industrial workers were organized, only about 12% of the steel workers. About two-thirds of the coal miners were union members, but only half that number were paying dues. The country was in the depth of its worst depression. The unemployment of about one-fourth of the labor force made monopoly control by labor seem so remote as to be almost fanciful.

But after only seventeen years devoted to the promotion of labor union organization by the federal government, we have labor monopoly with us. In its power and scope it makes the alleged business monopolies being prosecuted under the federal anti-trust laws seem positively piddling. In its manners it makes the old-time business monopolists look like Lord Fauntleroys.

What is lacking, grievously lacking, is action by Congress; action to shape our federal anti-trust laws to take account of the labor monopoly that has become the dominant national force in our country today—a force that is leading to the loss of freedom of all workers.

Before labor monopoly is broken up, as it must be broken up if our economy is not to be permanently wrecked, other steps will no doubt be required. But one test more than any other will be the touchstone of the nation's determination to keep its economic and personal freedom. It is what it does to see that labor monopoly receives the same treatment under the federal anti-trust laws as any other kind of economic monopoly.

The purpose of the federal anti-trust laws is to break up monopoly and preserve fair competition in the United States. It is a fine purpose. The wisdom and fairness of its application in particular cases is often open to challenge. But in spite of bad administration every farsighted business man I know is a staunch defender of our national anti-trust policy.

At present, in the exemption of labor monopoly, we have a breach in that policy which, if not closed, will soon become fatal both to the policy and the enterprise system it is designed to foster and protect.

The main thing wrong today with Great Britain and indeed all Europe is that no effective anti-trust laws are in existence to protect the public from business and labor monopolies, to guarantee personal freedoms. No free economy in Europe or America can prosper as long as protected monopolies remain and flourish.

While your representatives in Congress are home with you talk to them about the special privileges now granted to labor union monopoly. You would serve your country well by finding out what they intend to do about it before it is too late.

President, McGraw-Hill Publishing Company, Inc.

Try the NEW Pender now in the 4th Edition

ELECTRICAL ENGINEERS' HANDBOOK

HAROLD PENDER
Editor-in-Chief

Vol. I—ELECTRIC POWER
with WILLIAM A. DEL MAR

Vol. II—COMMUNICATION—ELECTRONICS
with KNOX McILWAIN

Pender's compact collection of practical data, charts and tables has been completely revised and rewritten.

NEW TOPICS INCLUDED IN 4th EDITION

Circuit stability • symmetrical components • electronic rectifiers • aircraft equipment • servomechanisms • permanent magnets • plastic insulating materials • dielectric heating • frequency modulation • microwave plumbing • pulse techniques in communication and radar • and other subjects.

Volume I—ELECTRIC POWER comprises nineteen sections—each a thorough treatment by experts in the field. There are over 400 additional pages in this volume. Typical subjects covered are: properties of materials, wiring of buildings, power transmission and distribution, testing of D-C machines, and electrical equipment in aircraft.

Volume II—COMMUNICATION—ELECTRONICS will be ready soon. The two volumes can be purchased separately or as a set. Together, they offer complete coverage of the electrical engineering field. Separately they make convenient individual working tools for those with specialized interests in the field. They are part of the Wiley Engineering Handbook Series.

Volume I
October 1949
1716 pages
977 illus.
$8.50

Volume II
In Preparation

EXAMINE BOOK FOR 10 DAYS

ON APPROVAL COUPON

JOHN WILEY & SONS, INC.
440 Fourth Ave., New York 16, N. Y.

Please send me, on 10 days' approval, a copy of Pender's ELECTRICAL ENGINEERS' HANDBOOK, **Volume I—Electric Power.** If I decide to keep the book I will remit $8.50 plus postage; otherwise I will return the book postpaid.

Name .....

Address .....

City .....Zone.....State.....

Employed by .....

(Offer not valid outside U.S.) EW-11-49

CATALOGS • BULLETINS

● **INSULATORS**: Publication 4711 lists all outdoor swieth and bus insulators of the cap-and-pin type, which meet the B. I. L. standards for each voltage rating. Dimension of individual units are shown and a tabulation is included, showing essential mechanical and electrical characteristics. Delta-Star Electric Co, 2400 Block, Fulton St, Chicago 12, Ill.

● **ALLOYS**: Designed primarily for electrical engineers, a new 26-page booklet describes the electrical and electronic properties of 18 high nickel alloys. The booklet cites typical uses of these materials, their mechanical and other properties, and the various forms in which they are available. International Nickel Co, Inc, 67 Wall St, New York 5, N. Y.

● **SWITCHGEAR**: Construction features of Allis-Chalmers modern-metal-enclosed low-voltage switchgear and drawout air circuit breakers are described in a new eight-page booklet, Bulletin 18B6376A. Portrayed is the rigid self-supporting structure of the switchgear's framework and its pantograph construction. A chart supplies dimension and typical panel data on the switchgear which is available in current ratings of 15 to 5,000 amp, interrupting ratings to 100,000 amp, 250 v d-c and 600 v a-c. Allis-Chalmers Mfg Co, 932 S. 70th St, Milwaukee, Wis.

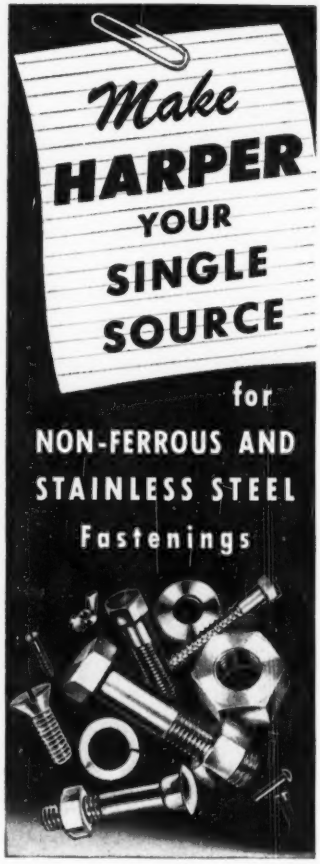
● **POLES**: A new 18-page technical bulletin, the "Pole Buyers' Guide," presents service records, electrical resistance information and camparative cost figures of pressure-creosoted poles. Koppers Co, Inc, Wood Preserving Div, Koppers Bldg, Pittsburgh 19, Pa.

● **CONDENSATE CONTROL**: The technical portions of an expanded 25-page bulletin, Publication No. 3250, on high pressure condensate return systems contain data on steam flow conditions and heat exchange characteristics. Cochrane Corp, 17th St & Allegheny Ave, Philadelphia 32, Pa.

● **MOBILE RADIO**: 152-174 mc mobile communication equipment type CMV-1A, is described in an eight-page bulletin. This RCA Carfone is applicable to the public utility, police, fire, trucking, taxi and forestry fields. Radio Corp of America, Engineering Products Dept, Camden, N. J.

● **CONTROLS**: Mot-O-Trol, a packaged electronic, adjustable speed drive for precise control of d-c motors operated from a-c sources is described in a 23-page booklet. Westinghouse Electric Corp, P. O. Box 868, Pittsburgh, Pa.

● **TEXTILE EQUIPMENT**: The following bulletins are available: GEA-5010, Textile Range Drives; GEA-5011B, Loom Motors; GEA-5012, Center-wind Batcher Drives; GEA-5214, Tenter Rail Guiders; GEA-5258, Adjustable-Speed Warper Drives; GEA-5259, Slasher Drives. General Electric Co, Apparatus Dept, Schenectady 5, N. Y.



BRASS • BRONZES • COPPER • MONEL • STAINLESS STEEL

Only HARPER carries large stocks of **6,000 DIFFERENT ITEMS** in from **3 to 10 DIFFERENT METALS!**—the widest assortment of bolts, nuts, screws, washers, rivets and accessories **available from ONE SOURCE.**

Convenient Warehouse Service for prompt delivery to any point in the country.

Wire or phone your requirements to the nearest Branch Office. Complete 134-page color catalog sent upon request.

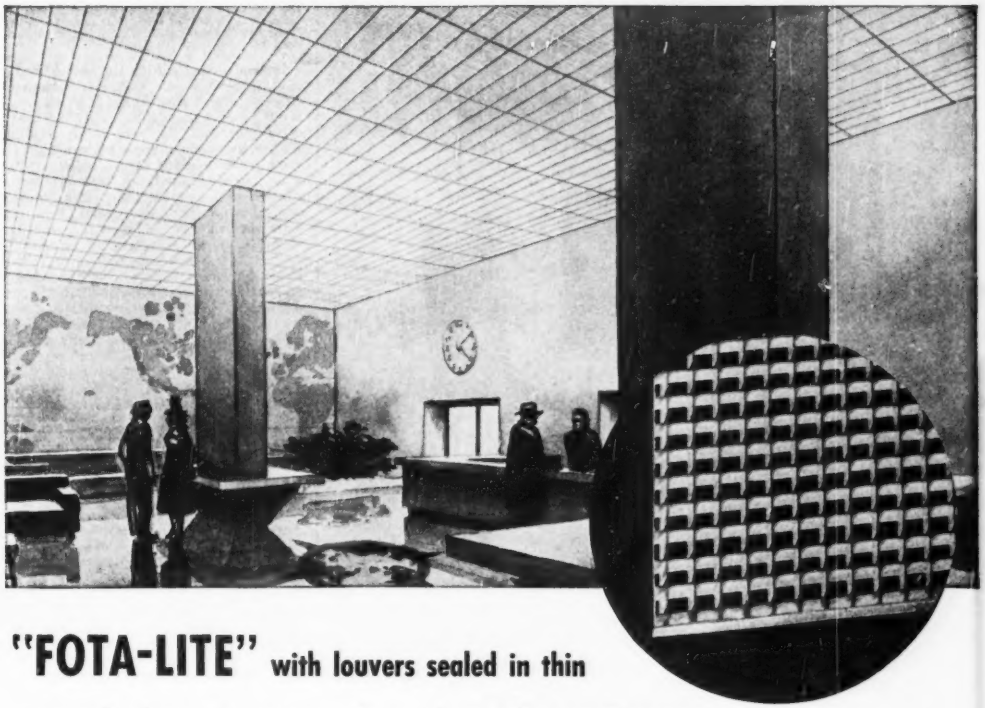
THE H. M. HARPER COMPANY
General Offices and Plant: Morton Grove, Illinois
(Suburb of Chicago)

New York Office and Warehouse: 200 Hudson Street, New York 13; **Los Angeles Office and Warehouse:** 835 E. 31st Street, Los Angeles 11. **Branch Offices:** Atlanta, Cambridge, Cincinnati, Cleveland, Dallas, Denver, Detroit, Grand Rapids, Milwaukee, Oakland, Philadelphia, Pittsburgh, St. Louis, Seattle, Toronto (Canada).

HARPER

EVERLASTING FASTENINGS

SOMETHING NEW IN HIGH LEVEL ILLUMINATION!



"FOTA-LITE" with louvers sealed in thin smooth glass, gives you a clean, dust-tight installation

"FOTA-LITE," Corning's newest lighting glassware, is designed for efficient high level illumination. Instead of bulky, hard to clean materials, you control light distribution with louvers *sealed in a thin panel* of glass. Thus, fixtures can be made shallower and dust-tight. The smooth surface of "Fota-Lite" can be wiped clean quickly. Original efficiency remains unimpaired.

Due to a cell size many times smaller than conventional louvering materials, this glass, in a fixture, has the appearance of plain opal. However, light directed vertically passes almost unrestricted through the clear sections.

Strong, light in weight, free of warpage and available in standard or special patterns, "Fota-Lite" combines many advantages which radically improve louver panel lighting. It is also non-color selective, important in maintaining true color values. Ask for Bulletin LS-24.

LOUVERED GLASS FOR MODERN LIGHTING—A NEW LOUVERING MATERIAL

CORNING means research in GLASS

PYREX T.M. REG. U.S. PAT. OFF.

CORNING GLASS WORKS
Lighting Sales Department
Corning, New York

SALES OFFICES:
New York
Chicago
San Francisco

CORNING GLASS WORKS, Dept. EW-11, CORNING, N. Y.
Please send Bulletin LS-24, describing Fota-Lite.
NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____

NEW!

C-O-TWO

DRY CHEMICAL TYPE
FIRE EXTINGUISHER

EXCLUSIVE DESIGN

assures you of fast, positive fire protection

SELF-CONTAINED UNIT . . . rugged construction . . . no extra gadgets protruding or complicated operating parts . . . one of the most efficient, foolproof, easy-to-use fire extinguishers known . . . two convenient sizes, 20 pound capacity and 30 pound capacity.

C-O-TWO DRY CHEMICAL STAYS FREE FLOWING . . . no syphon tubes or valves within the cylinder to become clogged or inoperative . . . discharge hose and squeeze type discharge nozzle remain empty until the fire extinguisher is actuated. Inverting the fire extinguisher before using provides mechanical breakage by changing the position of the dry chemical in the cylinder. Bumping to actuate the fire extinguisher provides additional mechanical breakage as well as continuous carbon dioxide gas pressured agitation or fluffing of the dry chemical. These combined features plus a skillfully blended free flowing extinguishing agent assure you of a faster, more effective and complete discharge.

APPROVED . . . Underwriters' Laboratories, Inc. rating is B-1, C-1. C-O-TWO Dry Chemical is non-conducting, non-corrosive, non-abrasive, non-freezing and non-toxic . . . highly effective on flammable liquid and electrical fires.

RECHARGEABLE ON-THE-SCENE . . . no special tools needed . . . one piece removable top assembly leaves large unobstructed opening in the top of cylinder for refilling. C-O-TWO Dry Chemical for recharging is available in handy pre-measured moisture proof containers.

Write today for complete free information on this new, quick-acting fire extinguisher . . . no obligation.

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY
Sales and Service in the Principal Cities of United States and Canada
AFFILIATED WITH PYRENE MANUFACTURING COMPANY

BOOK REVIEWS

The Fundamentals of Electromagnetism. **By E. G. Cullwick. Published by Cambridge University Press, New York 10, N. Y. 327 pages illustrated. Price $4.**

In this revised edition the author recognizes the confusion that most electrical students experience when they are confronted with the hypothetical unit magnetic pole and the concept of a field. Rather he subdues these fictions and focuses on force-action at a distance all the while striving to bring electromagnetic phenomena into conformity with present day electron physics without injecting wave mechanics or quantum theory. After transition from electrostatics to electromagnetics the treatment embraces induction, the generator, transformer, motor, magnet, ferromagnetics. A final chapter deals with electromagnetic waves and vector potential. A notable feature is the review of the contributions of the masters and another the discussion of the MKS system of units.

A Brief for Corporation Libraries: A Guide for Their Operation and Management. **By Alma C. Mitchill. Published by Special Libraries Association, New York 3, N. Y. 59 pages. Price $1.75.**

This book should have particular interest for electric utilities because the editor is librarian for Public Service Electric & Gas Co. It treats the beginnings of a company library in a departmental collection or research bookshelves, what policies should be set in extending the number and scope, how much the budget should be and the space for growth. Problems of the librarian lucidly discussed in wide range are sampled thus:—how to keep executives from monopolizing the books, how to digest periodical articles for busy supervisory staff and how to decide on degree of specialization in title classification. An unsatisfactory or inadequate utility library could be rectified by study of this practical little book.

Steam Power Plants. **By Philip J. Potter. Published by the Ronald Press Co. New York 10, N. Y. 503 pages illustrated. Price $6.50.**

Without much initial discussion of the thermodynamics on which steam power plant design is based the author chose to enter by way of fluid flow and pumps with more than the usual attention to pipe friction data. After transition to heat transfer phenomena there is a good chapter on fuels and combustion preparatory to discussion of boilers and their auxiliaries and heat exchangers. Treatment of steam turbines is essentially descriptive. Heat balance and station economics closes the book which is primarily thus a discussion of major component elements of the plant. The author makes little effort to deal with the coordination of those elements as the designer has to do, nor does he hold rigorously to his preface promise to minimize the contrasting of alternative commercial forms of station equipment.

BOOKS RECEIVED

Elektrotechnisches Praktikum. **By Franz Moeller. Published by Springer-Verlag, Berlin/Gottingen/Heidelberg. 311 pags, illustrated. Price DMark 20.**

Abriss der Dauermagnetkunde **By Johannes Fischer. Published by Springer-Verlag, Berlin/Gottingen/Heidelberg. 240 uages, illustrated. Price DMark 39.**

a sound plan for

financing and refinancing

When you want to expand your business, a basic problem is HOW to get adequate capital at minimum cost. The road to the capital market is full of stumbling blocks, the greatest of which are the many procedures and regulations involved in issuing securities.

That's where EBASCO can help you

EBASCO's financial consultants are specialists in this field. In the past few years they have assisted clients in obtaining capital in amounts totaling more than $1,400,000,000. Your particular problem is studied and financing plans developed. Advice is rendered on appropriate methods of financing, how to file and prepare your registration statement, how to prepare the diverse material required by the SEC, how to find the proper underwriters of securities, and how to time the marketing of the securities.

Not only do you have a sound plan for marketing your securities, but your executives are unencumbered by the details of financing and are able to handle their regular duties with a minimum of interruption.

EBASCO's financing specialists will be happy to outline their services at your request. There is no obligation for preliminary discussions. Feel free to call on us.

EBASCO SERVICES
INCORPORATED

Two Rector Street
New York 6, N. Y.

ENGINEERS · CONSTRUCTORS
EBASCO
BUSINESS CONSULTANTS

Appraisal · Budget · Business Studies · Consulting Engineering
Design & Construction · Financial · Industrial Relations
Inspection & Expediting · Insurance & Pensions
Purchasing · Rates & Pricing · Research · Sales & Marketing
Systems & Methods · Taxes · Traffic

DO YOU KNOW,
MR. UTILITY OPERATOR THAT

BENDIX FRIEZ

Bendix-Friez INSTRUMENTS

Can help you anticipate an increased power load due to an approaching cold wave with its accompanying high winds

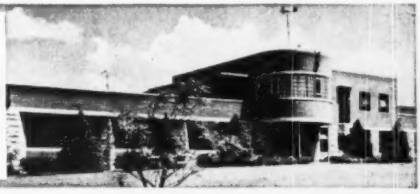
The recorded curves of wind speed and direction, and of temperature, combined with other continuous pertinent weather data, can be interpreted and extrapolated to give you advanced warning of loads to be expected from low temperatures, high winds and continuous cold or stormy weather. Proper distribution of generating capacity depends on advance knowledge of conditions to be met.

Forecast tomorrow's weather with today's instruments; be prepared to meet anticipated loading before it develops with intelligent action based on sure knowledge.

Write Bendix-Friez for data on Aerovane, the most modern wind-speed and direction recording system, and other Bendix-Friez instruments for weather prognostication. And remember—whatever your needs for weather data, and wherever you need to collect them, BENDIX-FRIEZ makes the best instruments for the purpose.

SOURCE of the WORLD'S FINEST WEATHER INSTRUMENTS

and a principal supplier to the United States Weather Bureau for over 73 years.

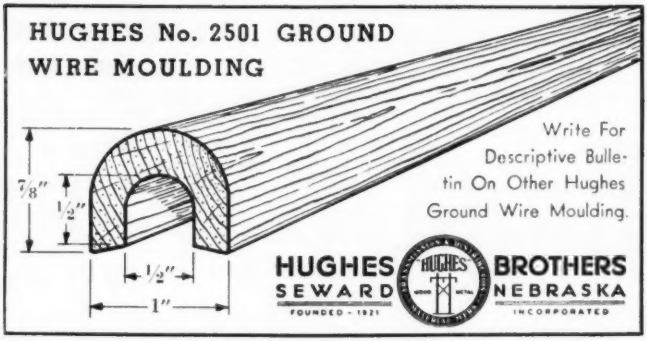


FRIEZ INSTRUMENT DIVISION of
1350 Taylor Avenue
Baltimore 4, Maryland

Bendix AVIATION CORPORATION

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N.Y.

HUGHES No. 2501 GROUND WIRE MOULDING



Write For Descriptive Bulletin On Other Hughes Ground Wire Moulding.

HUGHES BROTHERS
SEWARD NEBRASKA
FOUNDED - 1921 INCORPORATED

ELECTRITE
A high grade fibre board for electrical insulation. A material of quality possessing high tensile and dielectric strength. Used by many of the leading manufacturers of electrical equipment.

DENSITE
An extremely hard board of superior quality which can replace the more expensive types of insulating materials.

Pulp Products Department
WEST VIRGINIA PULP & PAPER COMPANY
230 Park Ave., New York 17, N. Y. 35 E. Wacker Drive, Chicago 1, Ill.

UNEQUALLED
... FOR MAKING LASTING SPLICES

...users who KNOW buy only the BEST

Ask for them by name...
OKONITE and MANSON tapes

ADVERTISEMENT
FOLLOWS STRAIGHT LINE . . .

...To Buying Information

With logic born of his profession, Mr. Frederick M. Hill, member of the firm of Hill & Harrington, Consulting Engineers, at New Haven, Connecticut, follows a straight line to his objective when he and his staff seek specific Buying Information on all types of electrical machinery, equipment, supplies and services.

That is why McGRAW-HILL PRE-FILED ELECTRICAL CATALOGS—a completely indexed collection of manufacturers' catalogs—is a valued fixture in his office. It is (to use his own words) *"In continuous use in connection with our specifications and for information to Bidders."*

If PRE-FILED ELECTRICAL CATALOGS is not available for buying reference at your plant, write to McGRAW-HILL CATALOG SERVICE, 330 West 42nd Street, New York 18, N. Y. There is no charge to qualified users.

LETTERS TO THE EDITOR

A Service Corp Answers

To the Editor of ELECTRICAL WORLD:

In an article entitled Why Rate Experts, appearing on Page 76 of your issue dated September 10, 1949, you apparently attempted to undermine the business relations of this corporation and of all organizations which provide engineering and advisory service for utility consumers.

The article by inference casts doubt upon the value of the service we render our clients and intimates that the service should be furnished by the utility companies. As the editor of a publication primarily addressed to those in the utility field, you should be informed that the service cannot be performed by the utility company, and that if ever it were the consumer could not rely upon it.

Public service commissions have repeatedly held that the furnishing of such a service would discriminate against many users since the benefit would be enjoyed by relatively few, and the cost, being included in the rate base, would be borne by all. The utility companies obviously cannot do more than give assistance in the selection of rates.

Furthermore, the utilities cannot accept responsibility for the constant month by month review of charges which is necessary to intelligent advice. As you should know, when advice is given by the utility companies, they refuse to accept responsibility for the advice, or to warrant that the rate selected as a result of such advice is the most advantageous rate. While rate experts do not guarantee that the rates advised are the most advantageous, their continued existence as consultants depends upon the continued soundness of their advice.

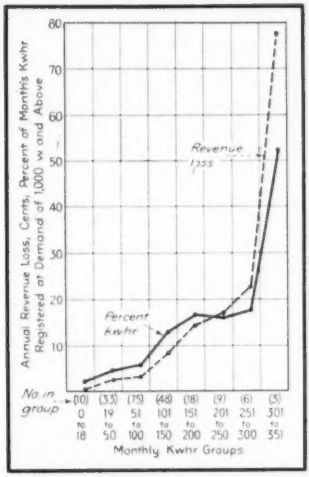
The closing paragraph of your article appears to indicate that you do not care to enter into a full discussion of the subject. It is regrettable that you should enter upon any discussion without being fully acquainted with all phases of the matter.

A. L. Stein
President
National Electric Service Corporation
New York

Meter Obsolescence

To the Editor of ELECTRICAL WORLD:

The article on Watthour Meter Obsolescence in your September 10, 1949 issue, by Mr. A. J. Keen, was very interesting, but I was unable to check



PERCENT OF MONTH'S kilowatt-hours registered at demand of 1,000 w and above, and annual revenue loss in cents, for 5-amp, 2-wire, 115-v metered services to 203 residential customers from August 1946 to October 1948. The percentage figures are weighted for each group and based on meter registration of 98% at 1,000 w and above

some of the data with our findings. Particularly, the assumed percent of total kilowatt hours used at the maximum demand, as depicted in Fig 4.

We carried on a survey throughout our state-wide system over the past several years, and found figures on this that were many times below those shown by Mr. Keen. Have attached two charts covering our results. [See curves above for charted results.]

The typical overload curve, shown in Fig 1, seems also to be out of line with similar data put out by the AIEE Committee on Instruments and Measurements of December 1941, pages 12, 13.

There is little doubt that the 5-amp, 2-wire meter is rapidly on its way out, but the conditions found here indicate that it is the changing over to 3-wire services, from the obsolescent 2-wire service, that forces the issue. Our figures indicate the 5-amp, 2-wire of the 1914-1926 vintage, does a pretty good job yet up to 250 kw-hrs per month.

Foss C. Hush
Superintendent of Meters
Consumers Public Power District
Lincoln 8, Neb.

Edison Chemical Meter

To the Editor of ELECTRICAL WORLD:

In the October 15, 1949, issue of ELECTRICAL WORLD you show an interesting selection of Edisonia, including an Edison meter, from the collection of Mr. Ward Harris of San Francisco. As

SAVE TIME • CUT COSTS • INCREASE SAFETY
With COFFING MAINTENANCE TOOLS

FLAG and FLAG HOLDER
Holder fits all poles. Main casting of malleable iron. Chain wraps around pole, hooks into main body of clamp; strong coil spring assures tension.

TEMPORARY GUY CLASP
Built on vise principle, with vise screw enclosed. Powerful grip, easy to handle. Automatic grip permits necking close to pole.

SAFETY-PULL RATCHET HOISTS
For heavier jobs. ¾-ton model weighs but 14 lbs. — 8 other models, handling up to 15 tons.

TRANSFORMER GINS
Model OST (shown) is of malleable iron and steel construction for top of pole.
Also available: Model ST—malleable iron and steel construction for side of pole. Model WT—wood and malleable iron, a non-conductor, for pole top.

POWER PIKE POLE
Built of two telescoping galvanized pipes. Power obtained from Coffing Load Binder or Safety-Pull Hoist. For straightening leaning poles. Minimum height 8' 2"; maximum 11' 7".

MIGHTY MIDGET PULLER
Weighs only 6½ lbs. — lifts or pulls 500 lbs. Handle operates as lever or high-speed crank.

COFFING TEMPORARY CROSS ARMS
— Light Weight, Built for Hard Use
Model 10-A (above) for electric work. Hooks self-locking, of certified malleable iron.
Also available: Model 10-C for changing cross arms on corners. Model 10-B has last four hooks on each end on swinging arm that may be locked open or closed; permits handling both straight and phantom circuits.

For more information on these tools or Coffing lifting and pulling equipment for any purpose, write Dept. EH.

COFFING HOIST COMPANY
DANVILLE, ILLINOIS

PLASTIC COVERS— Here are those new streamlined PLASTIC COVERS you've been hearing about. They are being shipped out as fast as they come off the molds, and you should hear some of the swell compliments we have been receiving — "Why didn't you produce these before?" — "The best change made in test switch covers," etc.

Cat. 204PF, 4½" base
Cat. 207PF, 7½" base
Cat. 209PF, 9½" base
Cat. 211PF, 11½" base
} Front Connected

Cat. 204PB, 4½" base
Cat. 207PB, 7½" base
Cat. 209PB, 9½" base
Cat. 211PB, 11½" base
} Back Connected

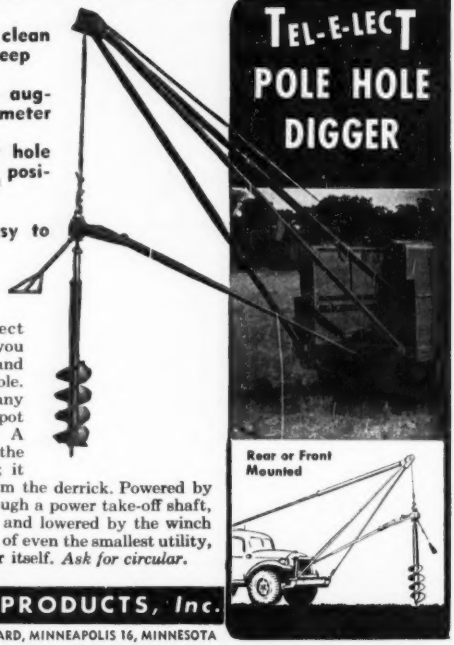
Pleasing to the eye, precision molded of heavy black Textolite, and being fully insulated, they cannot cause a short circuit when installing or removing. Specify them on your next order.

SWITCHES ENCLOSURES ACCESSORIES

METER DEVICES COMPANY • CANTON, OHIO

Operates ON ANY DERRICK TRUCK

- Adjustable for clean holes to 10 ft. deep
- Interchangeable augers 8" to 20" diameter
- Drills a straight hole from any truck position
- Easy to use—easy to transport



WITH the Tel-E-Lect Pole Hole Digger, you use the same truck and crew that sets the pole. You can drill a hole any place that you can spot the pole derrick. A single bolt attaches the digger to the truck; it works suspended from the derrick. Powered by the truck motor through a power take-off shaft, Tel-E-Lect is raised and lowered by the winch line. Fits the budget of even the smallest utility, and quickly pays for itself. *Ask for circular.*

TEL-E-LECT PRODUCTS, Inc.

10003 MINNETONKA BOULEVARD, MINNEAPOLIS 16, MINNESOTA

"VOLT-TELLING STATISCOPE" protects worker

. . . when held in any alternating electrical field. Indicates presence of voltage in AC and Pulsating DC Circuits and in various electrical apparatus. . . . Pocket-size illustrated above, also in Station and Overhead Extension types. Thousands in use. Order from Electrical Jobber. Send for new literature.

MINERALLAC ELECTRIC COMPANY

MANUFACTURERS OF STATISCOPES, HANGERS, CLIPS, STRAPS, INSULATING AND CABLE-PULLING COMPOUNDS

25 NORTH PEORIA STREET • CHICAGO 7, ILLINOIS

ANTI-CORROSIVE PAINTS

Subox

Fume and Acid Resistant

SubaLox

For Galvanized Structures, Including Fences.

Subox, Inc.

HACKENSACK, N. J.

BUY

all the U. S. Savings Bonds you can

and

KEEP

all the U. S. Savings Bonds you buy

the Edison Pioneer who supplied this chemical meter to Mr. Harris, I offer a minor correction to the legend under the picture of it, with some additional information which may interest the metermen of today.

Corrections and Further Details

In the second sentence of the legend the words "and grid" should be deleted and "chemicals" should preferably read "chemical solution." The so-called "grid" is really two "German silver" shunts in series, each of 0.02 (legal) ohm resistance. The current to be metered (rated limit, 9 amperes) flows through these shunts. Around each shunt is a branch path consisting of a voltameter in series with a 16-ohm copper coil. Each voltameter comprises two plates of amalgamated zinc in a solution of zinc sulphate of specified density. The plates are held at a definite distance apart by a hard-rubber separator and hard-rubber bolts. The resistance of the branch path is such that nominally a little over 0.001 of the total current flows through the voltameter. The zinc sulphate solution has a large negative temperature coefficient of resistance, and the function of the copper coil is to compensate for this and thereby keep the current which flows through the voltameter a constant fraction of the main current in spite of temperature changes. Each copper coil is behind its related shunt and cannot be seen in the picture.

Each shunt, with its coil and bottle, is a complete meter; the duplications resulted from a fear that a bottle might crack during the month and thus a part of the record be lost. In like manner, Edison 3-wire chemical meters had two shunts and two bottles in each side of the line.

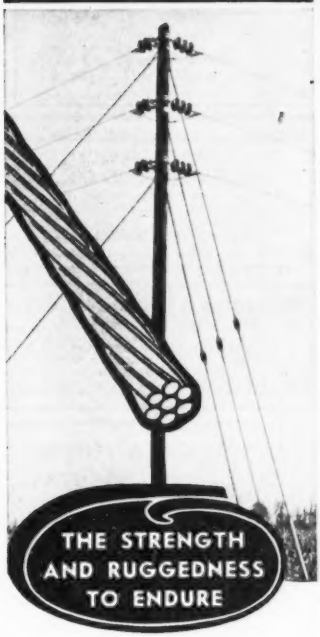
Thermostat Closes Lamp Circuit

Beneath the shunts is a straight bimetal thermostat (brass and iron, riveted together) which curves downward as the temperature falls and closes the lamp circuit before freezing can occur. An unexpected drawback to this device is the panic which sometimes resulted when the customer saw intermittent flashes of light inside the meter. I recall one case where this occurred one evening (of all places) in a flour mill; the state of mind of the manager of the mill may better be imagined than described.

As a minor detail, this meter was one of the original lot installed in 1884 in the Edison station at Piqua, Ohio, two years after the opening of the first Edison central station on Pearl Street, New York City.

H. B. Brooks
Consulting Electrical Engineer
Washington D C

Crapo
GALVANIZED STEEL
STRAND



STRENGTH to support the pole structure under maximum ice and wind loading . . . RUGGEDNESS to withstand the punishment incurred in construction and service . . . DURABILITY that outlasts the normal expectant life of the line . . . are combined—with important ECONOMY — in *Crapo* Galvanized Steel Strand.

Each size and grade develops the full tensile strength of the steel in cross section. The heavy, ductile, tightly-bonded zinc coating—applied by the famous *Crapo* Galvanizing Process—provides dependable protection for the steel.

ASK YOUR JOBBER!

There is a size and grade of *Crapo* Galvanized Steel Strand for every practical need. Consult the distributor of *Crapo* Galvanized Products near you or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

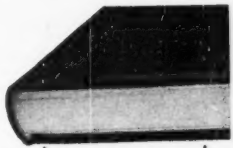
Now in permanent reference form . . .

Electrical World's valuable record of

THE DEVELOPMENT OF MODERN ELECTRIC SYSTEMS and APPARATUS

HERE IS the sweeping panorama of the evolution of energy generation, distribution and utilization. This is the story of the progress of the great American electric power systems, both private and public, and the philosophy and social and economic forces underlying their growth.

Designed for easy reading, this book brings you in compact form the unique record of the development of hydro- and turbo-electric power plants—of techniques for the construction, operation and maintenance of the far-flung systems—of public regulation over companies, their rates and their profits—of the spasmodic movements for federal and municipal ownership of electric utilities—and of the rise of industry organizations.



Reflects extensive research in the electrical power field, and is composed wholly of material as presented in the pages of *Electrical World*.

Just published

THE ELECTRIC POWER INDUSTRY

PAST, PRESENT and FUTURE

Compiled by the Editors of *Electrical World*

178 pages, 8½ x 11, illustrated, $3.50

Discusses—

- Power systems
- Power stations
- Station generation
- Transmission
- General system techniques
- Distribution
- Maintenance and metering
- Use of electricity
- Organization and regulation
- Industry organizations

THIS SURVEY of one of the world's greatest industries, spanning three-quarters of a century, is a permanent bound edition of the 75th Anniversary Number of *Electrical World*. Outstanding specialists from coast to coast contributed their knowledge and research to make this volume a unique log of industry achievement.

Every major phase of electric power development is covered—generating equipment, transmission lines, protective relaying, substation design, power metering, rural electrification, holding companies, state regulation, N.E.M.A., Edison Electric Institute, National Electrical Wholesalers Association, etc., etc.

The Electric Power Industry is truly a landmark along the road of free enterprise and scientific progress. It belongs in the library of every electrical man, those just entering the field, and students of this and related industries.

SPECIAL QUANTITY DISCOUNTS

Ideally suited for training of junior executives, sales staffs, and for use by other groups and key persons in the utilities field. When used for these purposes, books are available at special rates. In requesting discount information let us know number of copies you will need. Direct inquiries to:

SPECIAL SERVICE DEPARTMENT
Attention:
William E. Foley
McGraw-Hill Book Co.
330 W. 42nd St.,
N.Y.C. 18

SEE THIS BOOK 10 DAYS FREE

McGRAW-HILL McGraw-Hill Book Company, Inc.,
330 W. 42nd St., New York 18

Send me **The Electric Power Industry** for 10 days' examination on approval. In 10 days I will remit $3.50, plus a few cents for delivery, or return book postpaid. (We pay for delivery if you remit with this coupon; same return privilege.)

Name .....

Address .....

City ..... Zone ..... State .....

Company .....

Position W-11-19-49

This offer applies to U.S. only.

PROFESSIONAL SERVICES

BARKER & WHEELER

Utility and Industrial Valuations. Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal. Factory Production and Cost Control Systems.

11 Park Place, New York City
36 State Street, Albany, N. Y.

BLACK & VEATCH
Consulting Engineers

Electricity—Water—Sewage—Industry
Reports, Design, Supervision of Construction, Investigations, Valuation and Rates
4706 Broadway Kansas City 2, Missouri

HUGH L. COOPER & CO., INC.

General Hydraulic Engineering, including the design, financing, construction and management of hydro - electric power plants.

350 Fifth Avenue New York 1, N. Y.

DAY & ZIMMERMANN, INC.
Engineers

Design - Construction - Management
Investigations and Reports
PHILADELPHIA
NEW YORK Packard Building CHICAGO

Doble Engineering Company
Electrical Insulation Engineers

Field Testing and Maintenance of High Tension Insulation. Special Problems in Electrical Communications
Office and Laboratory: Doble Park
Box 344, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 20 N. Wacker Dr. Chicago, Ill.

Ebasco Services Incorporated
Engineers - Constructors - Business Consultants

Design and Construction
Financial and Operating Consultation
Investigations and Reports
Consulting Engineering
Two Rector Street New York

ELECTRICAL TESTING LABORATORIES INC.

Specializing in
TECHNICAL SERVICES
to those intent upon good quality
2 East End Avenue at 79th St., New York 21, N. Y.

ROBERT E. FOLEY CONSTRUCTION CORPORATION

Design—Surveys—Appraisals
Construction & Maintenance
Transmission—Distribution—Communication Lines
Substation, Radio and Television Towers
48 Griswold St. Binghamton, N. Y.

FORD, BACON & DAVIS
Engineers

DESIGN . CONSTRUCTION
VALUATIONS . REPORTS
New York . Philadelphia . Chicago . Los Angeles

GILBERT ASSOCIATES, Inc.
Engineers and Consultants

DESIGN AND SUPERVISION OF STEAM, HYDRO, WATER SUPPLY, SEWAGE DISPOSAL AND DIESEL PLANTS
Reports . Rates . Labor Relations . Safety
Purchasing . Costs . Laboratory
New York Reading, Washington
Houston Pa. Philadelphia

HARZA ENGINEERING CO.
Consulting Engineers

L. F. HARZA
E. MONTFORD FUCIK CALVIN V. DAVIS
Hydro-Electric Power Projects
Transmission Lines, System Management, Dams, Foundations, Harbor Structures, Soil Mechanics
400 W. Madison St. Chicago 6, Ill.

HOOSIER ENGINEERING COMPANY
Erecting Engineers
Transmission Lines, Substations

48 So. 5th St., Columbus, Ohio
327 South LaSalle Street, Chicago, Ill.
150 Liberty St., New York

N. A. LOUGEE & COMPANY
(Successors to J. H. Manning & Company)

REPORTS—INVESTIGATIONS—VALUATIONS
BUSINESS AND ECONOMIC STUDIES
120 Broadway New York

LUCAS & LUICK
Engineers

DESIGN, CONSTRUCTION, SUPERVISION, OPERATION, MANAGEMENT, APPRAISALS, INVESTIGATIONS, REPORTS, RATES
231 S. LaSalle St., Chicago

CHAS. T. MAIN, INC.
Engineers

Electric, Steam and Hydraulic Projects, Investigations, Reports, Designs and Appraisals
Chamber of Commerce Building
80 Federal St., Boston 10, Mass.

ARTHUR L. MULLERGREN
Engineering-Management
Public—Utilities—Natural Gas
Kansas City, Mo.

PIONEER SERVICE & ENGINEERING CO.

Consulting and Design
Engineers . . Purchasing . .
Specialists in Financing
Accounting and Other Operations
231 So. La Salle St. Chicago 4

Recording & Statistical Corp.

BILL ANALYSIS—CONSUMPTION STUDIES
THE ONE STEP METHOD
Bill Frequency Analyzer
100 Sixth Ave. WOrth 4-8326 New York 13, N. Y.

SANDERSON & PORTER
Engineers and Constructors

New York Chicago
San Francisco Los Angeles

SARGENT & LUNDY
ENGINEERS
140 South Dearborn St.
Chicago, Ill.

F. W. SCHEIDENHELM
Consulting Engineer

Hydraulic Engineering, Hydro-electric Development, Water Supply, Flood Control, Engineering Problems relating to Water Rights and Water Power Law. Appraisals.
50 Church Street, New York 7, N. Y.

F. A. TUCKER, INC.
Contractors—Engineers

specialize in
Distribution - Transmission - Telephone lines - Maintenance - Roads - Bridges Dams
Main Office—38½ Center Street, Rutland, Vt.
Branch Office—120 East 3rd St., Charlotte, N. C.

UTILITIES LINE CONSTRUCTION COMPANY, INC.
Construction and Maintenance

Transmission-Distribution
Electric and Telephone Lines
Consultants
501 York Road 1240 Oliver Bldg.
Jenkintown, Pa. Pittsburgh, Pa.

THE J. G. WHITE ENGINEERING CORPORATION

Design • Construction • Reports • Appraisals
80 Broad Street, New York 4

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:
(Not available for equipment advertising)
$1.20 a line, minimum 4 lines.
To figure advance payment count 5 average words as a line.
INDIVIDUAL EMPLOYMENT WANTED undisplayed advertising rate is one-half of above rate, payable in advance.
PROPOSALS, $1.20 a line an insertion.

INFORMATION:
BOX NUMBERS care publication New York, Chicago or San Francisco offices. Count as 1 line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED RATE:
The advertising rate is $9.75 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. E. W.

NEW ADVERTISEMENTS received by 10 A. M. November 25th, will appear in the December 3rd issue subject to limitations of space available.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500-$35,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service (39 years recognized standing and reputation). The procedure is highest ethical standards, is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present positions protected. Send only name and address for details. R. W. Bixby, Inc., 262 Dun Bldg., Buffalo 2, N. Y.

U. S. Government

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Specifications No. 2820) will be received by Bureau of Reclamation, Denver, Colorado, December 13, 1949, and then publicly opened for furnishing 1 main control switchboard for switchyard; supervisory control and telemetering equipment; and three 150-to 200-kva unit substations for Wellton-Mohawk Pumping Plants Nos. 1, 2, and 3 and Gila substation, Davis Dam Project, Arizona-Nevada, and Gila Project, Arizona. Delivery is desired within 300 to 360 days. For particulars, address Bureau of Reclamation, Building 1-A, Denver Federal Center, Denver, Colorado.
MICHAEL W. STRAUS, Commissioner. (100)

What is YOUR Problem?

Competent men for your staff? Employment?

Or, are you looking for — or offering — a business opportunity of special interest to men in the industry served by this publication?

The solution of any of these problems can logically be found *first* among *other* readers of Electrical World. You can get their attention—at small cost—through an advertisement in the Searchlight Section of

ELECTRICAL WORLD

ELECTRICAL DESIGNERS

ESTABLISHED BOSTON CONSULTANTS HAVE OPENINGS FOR ELECTRICAL ENGINEERS, DESIGNERS AND DRAFTSMEN WITH POWER PLANT AND INDUSTRIAL DESIGN EXPERIENCE.

P-1267, Electrical World
330 W. 42nd St., New York 18, N. Y.

EXCELLENT OPPORTUNITY

Nationally known manufacturer has place for an alert, aggressive young man with sales ability to contact public utility companies in either the Mid-West or Eastern states. Selling experience in the utility equipment field preferred. Should have mechanical engineering background or be conversant with automotive equipment in general. Provide complete statement of age, education, experience, qualifications and references. Write

SW-1461, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

TRANSFORMER MANUFACTURER

Looking for SALES Representation in Philadelphia Area for sale of Power and Distribution Transformers.

RW-9654, Electrical World
330 W. 42nd St., New York 18, N. Y.

SCHOOL

Electrical Meter Engineering
"The Profession With a Future"

Meter Department demands are bringing good opportunities to meter experts.
HOME STUDY COURSE
Practical up-to-date home study covers all phases of Meter Work
Write Today for Free Booklet
Fort Wayne Correspondence School
Dept. 111, 201 Dime Bk. Bldg. Fort Wayne 2, Ind.

WANTED

TRANSFORMERS WANTED
Purchase or Rent

Three each: 333 or 500 kva, single phase, 60 cycle oil cooled, new or used, primary voltage 4800—secondary voltage 240/480 with taps.

W-1303, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

THE CITY OF GLENDALE, CALIFORNIA
invites applications for

GENERAL MANAGER
AND
CHIEF ENGINEER
OF MUNICIPAL WATER, POWER, and LIGHT DEPARTMENT

Salary $12,600 Year

Immediate and permanent appointment to person showing best qualifications

Direct inquiries and biographical data to:
CITY MANAGER'S OFFICE
Attention: T. L. SHARP
613 East Broadway, Glendale, California
ALL COMMUNICATIONS WILL BE HELD STRICTLY CONFIDENTIAL
SUBMIT APPLICATIONS BEFORE JANUARY 15, 1950

TRANSFORMERS
POWER UNITS
Established Mfg. Plant
Price $55,000.
CONTACTS, INC.
58 W. 47th, N. Y., in Hotel Wentworth
LU 2-1267

OPPORTUNITIES!
in
New and used equipment recently released from service by a number of electric and gas utility companies

POWER PLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
SUBSTATION EQUIPMENT
TRANSMISSION LINE MATERIALS

Send for new list, . . . to

EBASCO SERVICES INCORPORATED
(APPARATUS EXCHANGE)
Two Rector St., New York 6, N. Y.

THE HOME OF VALUE AND QUALITY FOR . . .

ELECTRICAL POWER EQUIPMENT

WE CARRY A COMPLETE STOCK OF

QUALITY GUARANTEED "REBUILTS"

HERE'S A PARTIAL LISTING OF OUR TREMENDOUS STOCK.
IF YOU DON'T FIND WHAT YOU NEED—WIRE, WRITE OR PHONE;

WE CAN SUPPLY IT!

Squirrel Cage Motors—
3 Phase, 60 Cycle

H.P.	Make	Type	Volts	Speed
750	G E	KT	2300	720
700	G E	KF-56047	2300	1800
600	Westg.	CS-6-34-15	4150	1200
500	G E	K-559DZ	440	3600
500	G E	IK	2300	1800
500	G E	KTP-567	440	1200
500	G E	IK	440	900
400	G E	IK	2200	1800
400	Westg.	CS-936	2200	1800
400	Al Ch	ANW	440	900
400	G E	IK	440	600
350	Westg.	CS	2200	900
350	G E	IK	440	600
350	G E.	IK-14	440	511
300	G.E.	FT-559A	440	1800
300	G.E.	IK	440	900
250	G E.	KT-559	440	1800
250	Westg.	CS-8758	2200	1800
250	G E.	IK	2200	900
250	G E.	KT-564	440	900
250	Westg.	CS	440	900
250	G E	IK	2300	600
200	Al Ch.BB	AR	2200	1800
200	Wagner	26V	440	1800
200	Reliance	AA-C60855	440	1200
200	Westg.	CS	2300	1200
200	Westg.	CS-956A	2300	900
200	G E	K	2300	720
200	Westg.	CS-32B	440	720
200	Westg.	CS-950A	440	600
200	G E.	IK-15A	440	450
150	Westg.	CS-771-1C	440	1750
150	Westg.	CS	2200	1200
150	Cont. TEFC	NP-743K	440	900
150	Westg.	CS-950A	440	600
150	G E.	KT-564	2300	600
125	Westg BB	CS	440	3600
125	G.E.TEFC	K-6326S	440	1200
125	G E.	IK	2300	1200
125	Al Ch.BB	AR-826DS	440	1200
100	G.E.	KT	2300	1800
100	Burke	EM-12 5	220	1200
100	U.S.Vert.	CFU-994A	220/440	1200
100	Al Ch.BB	ARZ-826	440	900
100	G.E.	K-6333	440	720
75	Al.Ch.	AR-223-BS	2200	1800
75	AL Ch.BB	AR-505	220/440	1200
75	Al. Ch.	AR	440	1200
75	G E.TEFC	K-505	220	1200

SLIP-RING MOTORS
3 Phase, 60 Cycle
Sleeve Bearing except as noted

H.P.	Make	Type	Volts	Speed
2500	G E.	MT	6600	257
2000	G E.	IM	2300	360
1600	Al.Ch.	ANY	2300	257
1200	G E.	MT-26	2200	277
1000	Westg.	CW-424	4000	500
1000	Westg.	CW	2200	720
800	Westg.	CW	6600/440	507
700	Westg.	CW	2200	720
600	G E (3 Brg.)	ID	6600/2300	300
600	G.E.	IM	440	350
600	Cy Wh.	SR	6600	514
600	G E.	IM	2300	900
500	Ideal	AV-590	2200/4000	1800
500	G.E.	IM	2300	720
500	Al Ch.	ANY	440	600
500	Westg.	HP	440	400
500	Westg.	CW	2200	600
400	G E.	MT-412	2300	450
400	Al Ch	ANY	4000	514
400	Westg.	CW	440	900
400	G E.	IM	2300	900
350	Westg.	CW	440	720
350	Al Ch.	ANY	440	585
300	G E.	IM	440	450
300	G E.	IM-17B	2300	450
300	G E.	IM	2300	600
300	Al Ch.	ANY	2300	720
300	G E.	IM	440	1200
300	G.E.	IM	2300	1800
250	Westg.	CW-32B	440	900
250	Al Ch.	ANY	2300	300
250	Al.Ch.	ANY	2300	450
250	Westg.	CW	440	600
250	Al Ch.BB	ARY-8314	440	720
250	Westg	CW-32B	440	900
200	Al Ch BB	ARY-830D	440	900
200	Al Ch BB	ARY-826PS	440	1200
200	G E.	IM	2300	600
150	G E.	IM	440	450
150	Al Ch.	ANY	440	600
150	G E.	IM	2300	720
125	G E.	IM	2300	720
125	Al Ch.BB	ARY-826	2300/440	900
125	Al Ch.BB	ARY-826D	220/440	1200
100	G.E.	IM	440	450
100	Westg.	CW-856C	440	575
100	Al.Ch.	ANY	440	720

CHICAGO ELECTRIC

Carries a complete stock at all times in guaranteed "rebuilts"

- AC MOTORS
- DC MOTORS
- GENERATORS
- M.G. SETS
- CONVERTERS
- COMPRESSORS
- SWITCHBOARDS
- TRANSFORMERS
- CONTROLS
- HOISTS
- PUMPS

For prompt delivery to fill your needs—
PHONE
CANAL 6-2900

1st Source for 40 Years for Quality Electrical Equipment

CHICAGO *Electric Co.*

1324 West Cermak Road • Chicago 8, Illinois
Phone: Canal 6-2900

TRANSFORMERS
FOR SALE

3—500 KVA A-Ch 33000-2300
3—500 KVA G-E 2400-240/480
3—500 KVA G-E 11500-2300/4000Y
3—333 KVA G-E 33000-2300/4000Y
3—333 KVA G-E 13800-120/240
3—333 KVA G-E 2400/4160Y-240/480
1—250 KVA G-E 6900/11950Y-230/460
3—200 KVA G-E 6900/11950Y-230/460
3—200 KVA G-E 6600/11430Y-2300
3—200 KVA W-H 2300-460/230/115
3—150 KVA G-E 11000-2300/4000Y

3-phase
2—1500 KVA G-E 33000Y-2300Y/575
1—1800 KVA Wag 6600-575

Many other items in stock

TRANSFORMERS
WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
Cincinnati 27, Ohio

Power Equipment

Released by Utilities & Industrials

Turbines, Generators, Steam and Oil Engines, Boilers, Motor Generators, Rotaries, Transformers, Motors, Compressors, Induction Voltage Regulators, Oil Circuit Breakers, etc.

Service backed by 40 years' experience

BREW, WOLTMAN & CO.
52 Church St., New York 7, N. Y.

FOR SALE

SYNCHRONOUS CONDENSER

5000 KVA Westinghouse, 3 phase, 60 cycle, 4000 volt, 720 RPM synchronous condenser equipped with a 125 volt, Type SK, 720 RPM direct connected exciter with control panel and instruments. *Excellent condition—immediate delivery—exceptional value.*

UTILITIES MACHINERY CORP.
1965 E. 6th St. Cleveland 14, Ohio

FROM AVAILABLE STOCK

TURBO GENERATORS

KW	Make	Desc.
4000	G.E.	Auto extraction—250 lbs I.S.P 35 lbs. ext.—2300 v 3 ph. 60 cy.
750	G.E.	Condensing—250 lbs. I.S.P. 440 v. 3 ph. 60 cy.—Built 1944
450	Whse.	Condensing 250 lbs. I.S.P. 440 v. 3 ph 60 cy
400	Whse.	Non-condensing 125/150 lbs. I.S.P. 5 10 lbs. B.P.—240/480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

KVA	Make	Type	Volts	Speed
5140	Whse.		2400/4150	600
4000	G.E.	TSC	2400/4150	900
3000	Whse		2400/4800	720

MOTOR GENERATOR SETS
3 ph. 60 cy.

KW	Make	Speed	DC Volts	AC Volts
1800	G.E.	600	125/250	2300 4150
1500	G.E.	360	275	2200 4400
1500	G.E.	600	600	2300 4150
1250	G.E.	600	275	4150
1000	Whse.	900	600	4150

TRANSFORMERS—60 Cycle

Kva	Make	Type	Ph	Voltages
2666	Whse.	OISC	1	66000x11000
2500	G E.	LTG	1	13200x3300
2500	Al Ch.	OISC	3	13200x2300
2500	Pack.	AT	3	13800x2300
1250	G E.	HVDDJ	1	6600x550
1250	Maloney	C	1	4160x240 480
1000	G E.	HTI	3	13200x480
1000	Pitts.	OISC	1	13200x2300
750	Whse.	OISC	3	33000x2300
600	Al Ch.	OISC	3	2300/4150x220 440
500	Whse.	OISC	3	13800x230 460
333	Pitts.	OISC	1	2640x2600
167	G.E.	HS	1	2400x240-480

RE-NU-BILT BELYEA MOTORS

BELYEA COMPANY, INC.

OFFICE & SHOP
51 Howell St. Jersey City 6, N. J.

FOR SALE

One New Sauerman 3 Cu. Yd.

CRESCENT COAL SCRAPER BUCKET

Immediate Shipment

For Price Contact Mr. N. C. Stirewalt, V.P.

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
Illinois Building Springfield, Ill.

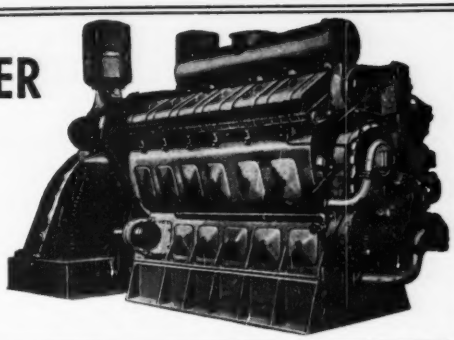
MOTORS, GENERATORS, TRANSFORMERS
1 — 1500 H.P
Bought and Sold New and Rebuilt
ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

DIESEL ELECTRIC POWER

FOR

IMMEDIATE DELIVERY

UNIT CAPACITIES—10 TO 1875 KVA
A. C.—50 AND 60 CYCLES
ANY VOLTAGE



A PARTIAL LIST OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1875	Fairbanks Morse	33F16	2000	300	375	Enterprise	DSG-6	450	450
1420	Fairbanks Morse	38D8⅛	1600	720	330	Superior	KNA	396	514
1250	General Motors	16-278A	1600	720	312	General Motors	8-268A	450	1200
937.5	General Motors	12-567	1080	720	187	Ingersoll Rand	S	225	514
625	Alco	6-12½x13T	750	600	125	General Motors	3-268A	150	1200
425	Baldwin	VO-6	510	450	75	General Motors	6043C	90	1200

WRITE FOR COMPLETE INFORMATION

Engineered AGSCO DIESEL POWER

A. G. SCHOONMAKER Company, Inc.

Diesel Engines • Power Machinery

ESTABLISHED 1898

ENGINE DIVISION 50 CHURCH STREET, NEW YORK 7, N. Y.

FOR SALE

1—General Electric A. C. Generator, KW 90 M. P. F. .8, Speed 900, 3 Phase, 28.2 Amps. 2300 Volts, 60 Cycles.

1—General Electric D. C. Generator, KW 2.5, Speed 1800, Volts 125, Amp. 20, Type ML.

1—General Electric A. C. Generator, KW 24 M. P. F. .8, Speed 300, 3 Phase, 7.5 Amps. 2300 Volts, 60 Cycles.

1—General Electric D. C. Generator, KW 3, Speed 1050, Volts 125, Amp. 24, Type ML.

1—9.375 KVA, 7.5 KW, 120 Volts, 60 Cycles, Single Phase Century Alternator with direct connected Exciter, direct connected to a 6 cylinder, valve-in-head, 4 cycle, Continental gasoline engine, 1200 RPM.

J. I. TRIPLETT ESTATE
Woodstock, Virginia

FOR SALE

Two—1800 KW General Electric Turbo-generator Units. 400# 725 F Condensing Turbine direct connected to 3600 RPM 2300 Volt 3 Phase 60 cycle generator with condenser, air jet ejectors and surface air coolers.

These units have just been completely reconditioned and rewound by General Electric and are available for immediate delivery from Buffalo, N. Y. warehouse.

Price—$38,000 per unit or $75,000 for both units.

Superintendent
Water and Light Department
Municipal Building Wellsville, N. Y.

FACTORY RECONDITIONED HOUSE TYPE ELECTRIC METERS—*LIKE NEW*

GENERAL ELECTRIC—SANGAMO WESTINGHOUSE

These are GUARANTEED Features

1. New Finish (Buffed and Painted)
2. New or New Appearing Dial Face
3. Jewels and Pivots replaced (normal use of meter, bearings will last 15 yrs.)
4. Register and Top Bearing Friction Removed.
5. Calibration — Accuracy between 99.0% and 101.0% on both Light and Full Load
6. All Meters Checked at 50% Power Factor and at Unity Power Factor
7. HIGH POT—Insulation breakdown tested at 1200 Volts to Ground

Meters packed for export in steel strapped specially designed meter cartons, such as manufacturers use, eliminating the expense of wood casing.

METERS WANTED

Warehouse in New York City

THE ELECTRICAL WATTHOUR METER CO.
76-15 Woodside Ave., Elmhurst, N. Y.
Tel. HAvemeyer 9-0131 Cable address Elwameter

BARGAIN

132,000 VOLT OIL BREAKER, G.E. FHKO-139-60, 1,500,000 KVA. SEND FOR STOCK LIST 117 ON SWITCHGEAR

JOSEPH P. MANYPENNY CO.
212 N. 21ST ST., PHILA. 3, PA.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

1606 53rd ST., NORTH BERGEN, N. J. N. Y. C. Tel. LOngacre 5-3277 N. J. Tel. UNion 3-2600

SLIP RING MOTOR
1—2500 HP G.E. MT. 257 RPM 6600 V
1—500 HP G.E. MT. 720 RPM 2200 V 4150.

SYNCHRONOUS CONDENSER
1—2500 KVA Whse 720 RPM 2200 V with D.C. exciter.

MOTOR GENERATORS
1—1000 KW Whse. 275 V. 720 RPM 4150 volt
1—1000 KW G.E. 600 V. 514 RPM. 2200/4000 V
1—500 KW G.E. 275 V. 900 RPM. 4150 volt

TRANSFORMERS
1—1000 KVA G.E. 3 ph. 4150 V-2400 V
1—1000 G.E. 3 ph. 4150, 2 ph. 2400 V.
3—400 KVA G.E. 6900 V. Pri. 2300 V Sec.
3—300 KVA Pitts. 2400 V Pri. 120/240 Sec.
3—300 KVA G.E. 2400 V Pri. 120/240 Sec.
3—150 KVA Whse. 2300 V Pri. 240/480 V Sec.
3—100 KVA G.E. 4150 V Pri. 240/480 V Sec.
Pyranol
6—50 KVA Whse, 4150 V Pri. 120/240 V Sec.
Inerteen

Complete Line of A.C. and D.C. Motors and Generators

Advertising In This Issue

Allen-Bradley Co. 19, 20
Allis-Chalmers Mfg. Co. 9, 12, 13, 78, 79
American Brass Co. 129
American Coach & Body Co., The 22
American Steel & Wire Co. 36, 37
Anaconda Wire & Cable Co. 26
Appleton Electric Co. 81
Armstrong Cork Co. 65

Baldwin Locomotive Works, The 70
Baxter & Co., J. H. 137
Bechtel Corp. 57
Bendix Aviation Corp., Friez Instrument Div. 175
Bentley Harris Mfg. Co. 40
Biddle Co., James G. 23
Blackburn Products Corp., Jasper 47
Brewer-Titchener Corp. 68, 69
Bristol Co., The 157
Brown Co. 152
Brown Co., Robert E. 64
Burndy Engineering Co., Inc. 34

Chance Co., A. B. 146
Cochrane Corp. 165
Coffing Hoist Co. 177
Continental-Diamond Fibre Co. 151
Copperweld Steel Co. 29
Corning Glass Works 173
Costello Co., J. J. 64
C-O-Two Fire Equipment Co. 174
Crescent Insulated Wire & Cable Co. 144
Crescent Tool Co. 50

Dow Chemical Co. 145
Dow Corning Corp. 166
Directory of Engineers 180
Duncan Electric Mfg. Co. 49
du Pont de Nemours & Co. (Inc.), E. I., Plastics Dept. 24

Eaton Mfg. Co. 25
Ebasco Services, Inc. 175
Electric Controller & Mfg. Co., The 35
Electric Storage Battery Co., The 30
Electrical Engineers Equipment Co. 41
Engineers, Directory of 180

Fleur-O-Lier Mfrs. 48
Four Wheel Drive Auto Co. 18

Gardner-Denver Co. 74
General Cable Corp. 71
General Electric Co.
Apparatus Dept. ...63, 119, 121, 122, 123, 160
Construction Materials Dept. 45
Lamp Dept. 141
General Radio Co. 31
Gould Storage Battery Corp. 56
Graybar Electric Co. 5
Grinnell Co., Inc. 38
Gulf Oil Corp. 44

Harper Co., The H. M. 172
Hazard Insulated Wire Works 4, 176
Hevi Duty Electric Co. 156
Hoosier Engineering Co. 72
Horne & Co., George R. 64
Hotpoint, Inc. 139
Hubbard & Co. 143
Hughes Bros. 176

Indiana Steel & Wire Co. 179
I-T-E Circuit Breaker Co. Third Cover

Johns-Manville 162, 163
Joslyn Mfg. & Supply Co. 73

Kearney Corp., James R. 130, 131
Koppers Co., Inc. 168, 169

Lapp Insulator Co., Inc. 32
Line Material Co. 51, 52, 53, 54, 55

Marcus Transformer Co., Inc. 150
McCabe Powers Auto Body Co. 33
McGraw-Hill Book Co., Inc. 179
McGraw-Hill Pre-Filed Electrical Catalogs 176
Meter Devices Co. 177
Miller Co., The 46
Minerallac Electric Co. 178
Minnesota Mining & Mfg. Co. 148
Moloney Electric Co. 125
Morrow & Son, Linn O. 64
Motorola, Inc. 60
Murray Mfg. Corp. ..... Second Cover

National Electric Products Corp. 84

Ohio Brass Co. 133, 134, 135, 136
Okonite Co., The 4, 176

Pacific Electric Mfg. Corp. 83
Pennsylvania Transformer Co. 10, 11
Pittsburgh Reflector Co. 161
Prat Daniel Corp. 66, 67
Preformed Line Products Co. 59
Pritchard & Co., J. F. 39

Railway & Industrial Engineering Co. 15
Reliable Electric Co. 62
RLM Standards Institute 14
Rockbestos Products Corp. 159
Roebling's Sons Co., John A. 21
Rome Cable Corp. 77
Ryerson & Son, Inc., Joseph T. 155

Sangamo Electric Co. 61
Searchlight Section 181, 182, 183
Silent Hoist & Crane Co. 132
Simplex Wire & Cable Co. 6
Spang-Chalfant Div. of National Supply Co. 8
Square D Co. 147
Stackpole Carbon Co. 82
Standard Oil Co. (Indiana) Fourth Cover
States Co., The 166
Subox, Inc. 178

Tel-E-Lect Products, Inc. 178
Texas Co., The 7

Unistrut Products Co. 153
United States Rubber Co. 167
United States Steel Corp. 36, 37, 80
United States Steel Supply Co., The 80

Victor Insulators, Inc. 27

Wagner Electric Corp. 76
West Virginia Pulp & Paper Co. 176
Westinghouse Electric Corp. 16, 17, 28, 42, 43, 75, 127, 149
Westinghouse Electric Corp., Lamp Dept. 58
Wiley & Sons, Inc., John 172

York-Hoover Corp. 158

■

PROFESSIONAL SERVICES 180

■

SEARCHLIGHT SECTION
(Classified Advertising)

EMPLOYMENT
Positions Vacant 181
Selling Opportunities Offered 181
Employment Service 181
EDUCATIONAL
Schools 181
BUSINESS OPPORTUNITIES
Offered 181
NOTICES
Proposal 181
EQUIPMENT
(Used or Surplus New)
For Sale 181-183
WANTED
Equipment 181

Now

Get the complete story on

MULTUMITE 600

I-T-E's *Improved Design*

LOW-VOLTAGE SWITCHGEAR WITH METAL-PANEL CIRCUIT BREAKERS

● Here are the facts switchgear purchasers have been waiting for—the complete, illustrated story of I-T-E's new MULTUMITE "600" . . . the latest development in the field of low-voltage switchgear. This new bulletin is now ready, waiting for your request. Write for Bulletin 6003-D. There's no obligation, of course.

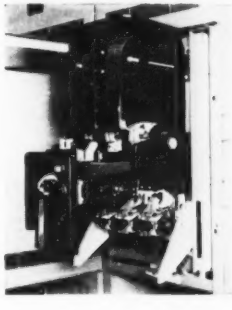
PARTIAL CONTENTS

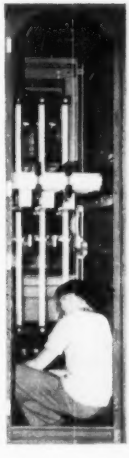
Bulletin 6003-D explains in detail the many new construction features of Multumite "600". There are clear, easily understood explanations of the new metal-panel circuit breakers, the improved, more accessible bus compartment, the completely enclosed wiring troughs, the improved provisions for mounting secondary devices, and the space-saving dimensions.

You'll also see such time-tested and approved I-T-E features as the pantograph-drawout mounting for circuit breakers, formed end-panels and doors, grille-type louvers, and the baked enamel finish.

There are sample specification information and dimension details to help you in selecting the best switchgear for your application.

SEND FOR
BULLETIN 6003-D
THE STORY OF I-T-E'S MULTUMITE "600"
TODAY!





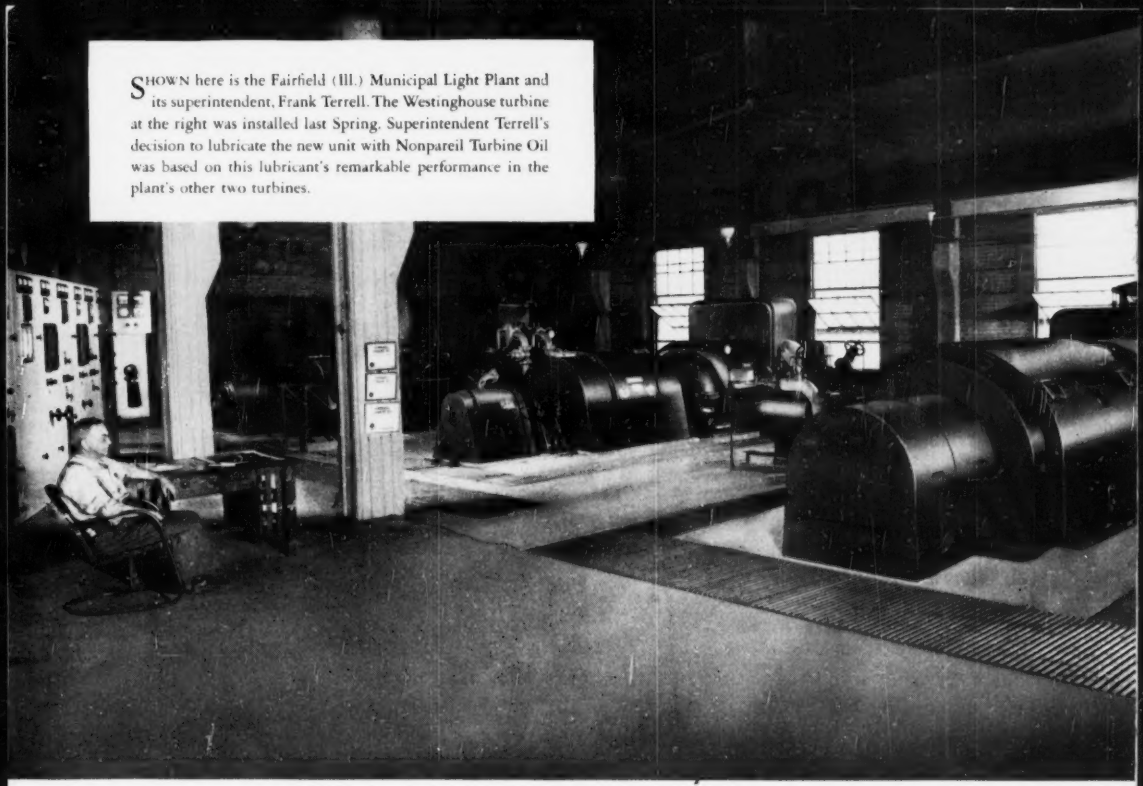
LOW VOLTAGE SWITCHGEAR

I-T-E Circuit Breaker Co., 19th & Hamilton Streets, Philadelphia 30, Pa.

Power Switching Equipment Division: Railway & Industrial Engineering Co., Greensburg, Pa.

Canadian Mfg. & Sales: Eastern Power Devices, Ltd., Toronto • Export Sales: Phillips Export Corp., New York

SWITCHGEAR • UNIT SUBSTATIONS • ISOLATED PHASE BUS STRUCTURES • CIRCUIT BREAKERS • MECHANICAL RECTIFIERS • RESISTORS • SPECIAL PRODUCTS



SHOWN here is the Fairfield (Ill.) Municipal Light Plant and its superintendent, Frank Terrell. The Westinghouse turbine at the right was installed last Spring. Superintendent Terrell's decision to lubricate the new unit with Nonpareil Turbine Oil was based on this lubricant's remarkable performance in the plant's other two turbines.

Here's minimum turbine-oil maintenance

CENTRIFUGING once a year is the only turbine-oil maintenance found necessary at the Fairfield Municipal Light Plant, Fairfield, Illinois. This practice has been followed ever since 1940, when Nonpareil Turbine Oil first went into the plant's new 1500-KW Westinghouse turbine. The same routine has been employed on a second Westinghouse unit of 2500 KW, installed in 1942.

During these 8 and 10 years of operation, the original fills of Nonpareil have not been removed either for treating or for replacing. Neutralization numbers have stayed below 0.08 mg KOH/gm. Oil systems have remained entirely clean.

Such lubricating economy and efficiency is not limited to 10- or 15-year records with Nonpareil Turbine Oil. Each fill of Nonpareil carries a written guarantee that it will remain below a neutralization number of 0.15 mg KOH/gm. *for the life of the turbine* it lubricates. 21-year service records of Nonpareil provide evidence of its ability to end acidity trouble and oil maintenance once and for all.

A Standard Oil Lubrication Engineer will be glad to supply you with actual case histories of utility operations in which Nonpareil Turbine Oil has reduced lubrication costs as much as 68%. Your letter will obtain the Engineer's services.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

NONPAREIL
Turbine Oil

"Will outlast your turbine"

STANDARD OIL COMPANY (INDIANA) STANDARD